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Artificial Incubating and Brooding

A PRACTICAL WORK CONTRIB-
UTED TO BY THE MOST EXPERT
OPERATORS OF INCUBATORS ✂
AND BROODERS IN AMERICA. ✂

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Artificial Incubating and Brooding

A PRACTICAL WORK, CONTRIBUTED TO BY THE MOST EXPERT OPERATORS OF INCUBATORS AND BROODERS IN AMERICA.

PROFUSELY ILLUSTRATED.

PRICE, FIFTY CENTS.

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GUARANTEED.

In the back pages of this book will be found the illustrated, descriptive advertisements of several of the very best and best-known incubators, brooders, bone cutters and other poultry supplies manufactured to date. These goods, without exception, also the men who manufacture and sell them, are known to the editor and publishers of ARTIFICIAL INCUBATING AND BROODING, and we guarantee the goods to be standard (the best made in their respective lines), and the manufacturers to be responsible business men, who will live up to every representation and treat their patrons with due consideration. Only advertisements of this class of goods, made by men personally known to us to be reliable, were solicited or accepted. It is of vital importance that persons who embark in the poultry business shall have the best equipment obtainable. On this depends the measure of their success, and the readers of this book are advised against taking undue risk. Do not, therefore, make the mistake of buying "cheap" goods. Competition is now so keen in these lines that you can get the best at a fair price, and anything short of the best will cost you far more than the difference in prices. We know whereof we speak, and urge every reader of these lines to be governed in this respect by sound business judgment. No solvent business man sells his goods first hand at less than they cost him. Be prepared to pay a fair price, place your orders with well-known, responsible men and you will then get what you buy, or will be in a position to demand satisfaction. We repeat that every advertiser whose announcement appears in these pages is fully guaranteed by

THE RELIABLE POULTRY JOURNAL PUBLISHING CO.

QUINCY, ILL., November 1, 1898.

(INCORPORATED.)

INTRODUCTORY.

JUST how much the modern incubator and brooder have had to do with the recent rapid development of the poultry industry in this and other countries is hard to estimate, but unquestionably they have been one of the most important factors. Hatching chickens by artificial means is almost as old as history, for it was practiced before the dawn of the Christian Era and has been practiced continuously in Egypt, China, and other oriental countries down to the present day. For an authentic account of how hen eggs are hatched at present by artificial means in Egypt, see report of the United States consul in the following pages. For many years past, in fact, during at least three or four centuries chickens have been hatched artificially in European countries, notably in France, England, Belgium and Denmark; but it has remained for Yankee genius to modernize and practically perfect the present popular-sized incubators and brooders and to devise ways and means of hatching and raising chicks in large numbers by their use on the city lot, the village acre and the ordinary farm.

We are not prepared to say that the use of incubators and brooders in America will eventually do for the American hen what the use of incubatories has done for the Egyptian hen, that is, cause her to abandon altogether the work of hatching eggs and raising chickens, but it is possible and even probable that this will come to pass sometime in the distant future. There is no longer room to doubt that the incubator and brooder method of hatching and raising chickens and ducklings is a marked improvement over the hen method. It is an improvement in the sense that it is cheaper, also that it is better, also that a far greater number of chickens and ducks can be raised by the use of incubators than could be profitably raised with hens. The reader of this book will learn that broiler plants now exist and are being successfully operated in this country where thousands of chickens are raised in limited quarters by artificial means, and that duck ranches exist and are in successful operation where from twenty to twenty-five thousand ducklings are raised each season. All these chickens and ducklings are produced by artificial means and it would be practically impossible to produce the same numbers by the hen method. To do so would require many acres of land, thousands of square feet of buildings and a small army of men or women to take care of the hens. The invention and perfection of the modern incubator has made all this possible, hence so far as the market poultry business is concerned, it owes a very great deal to artificial incubating and brooding.

When we come to consider the incubator and brooder on an ordinary farm, the thought suggests itself and gradually takes the form of actual belief that sooner or later the incubator and brooder will supplant the hen as a sitter and mother in the production of poultry, for it is a well known fact that on hundreds, yes, thousands of farms, taking the country over, the hen method has already been abandoned by the farmer or his wife, and incubators and brooders are being used simply and solely because they do better work with less labor, hence are more profitable. The number of farms on which this condition exists is increasing from year to year and the question arises, "How long will it be before every intelligent and progressive farmer or farmer's wife who wishes to better his or her condition, will find other and more profitable work for the hen to do than to sit on her eggs and serve

as mother to a brood of chicks for a number of weeks, and will call to their assistance the artificial hen and mother—modern inventions that are able to do the work better and cheaper?"

We believe it is only a question of a comparatively short time when the American hen will be used almost exclusively for the production of eggs, rather than to have her valuable time wasted in doing work that can be done better and cheaper by artificial means. The hen has a monopoly in the production of eggs. We can hatch her eggs for her and raise her chicks, but we cannot manufacture eggs that will hatch. She will always be in demand, therefore, and it is plainly to the advantage of poultry keepers to use her exclusively for egg production.

According to the United States census of 1890, the average American hen laid at the time the census was taken, less than one hundred eggs per year. It is no doubt true that the average hen on the average American farm, where she is still used as a sitter and mother, does not lay to exceed one hundred eggs during three hundred and sixty-five days, and it is doubtful if she lays more than six or seven dozen eggs during the year. Poultrymen the country over have repeatedly demonstrated that an average flock of standard-bred fowls can be induced to lay from one hundred and fifty to two hundred eggs per year, under proper treatment. When we consider that the hens of America laid during the year 1890 over six hundred million dozen eggs, we get a glimpse of the national loss resulting from the average hen laying only seventy-five to one hundred eggs per year, when she could have been induced to lay twice that number. As this country doubles and trebles in population, all such losses as this will be carefully looked after and scientifically treated. This means, if it means anything, that the poultry industry will increase and develop along systematic lines and the incubator and brooder will be called into very general use.

The writer of these lines has traveled upwards of fifteen thousand miles during the past five years, visiting poultry plants, large and small, and during this time has made a careful study of different branches of the poultry business. Long strides have been taken during even this short period until at the present time we hear it commonly said, "The incubator is now a practical success. It is no longer any trouble for a person of ordinary intelligence and careful habits to hatch chickens in large numbers by the use of incubators, but it is not so easy a matter to raise them." This is true, and it isn't true. It is a singular fact that for every three people who can be found who will say, "Oh, yes, I can hatch them all right, but I do not have very good success raising them artificially," one person can be found who will say, "I cannot hatch them so well with incubators as I can with hens, but I can raise them in brooders lots better than I can with hens."

This simply means that different methods are employed, some of which are right and others wrong. It simply means that up to the present time more careful attention has been given by experts to the work of perfecting the incubator and demonstrating the proper use of it, than to the equally important work of perfecting brooders and brooding systems and solving the problems of their successful operation. The fact that many people in this country to-day are hatching eggs under hens and then placing the chicks in brooders to be raised artificially, is complete proof that chicks can be raised in brooders as well or better than they can with hens, and that

the brooder is as much an improvement over the hen as an incubator is an improvement on the hen as a hatcher. It is simply a question of knowing how, and that demand is really what called forth this book.

The poultry business in all lines is farther developed in the east than it is in the west or south. This is mainly due to density of population, and it is a remarkable fact that as population increases in density the prices for poultry of all kinds and for eggs steadily increase. This fact argues well for the permanency of the poultry industry. Eggs to-day bring higher prices in New England and in New York and New Jersey than they do in any other sections of the country, and the same is true of all kinds of poultry. In the New England and Atlantic states people are becoming fastidious and are willing to pay a high premium on strictly fresh eggs and extra choice poultry that is placed on the market in an attractive form. There is no room to doubt that these same conditions will obtain in other sections of the country, to the same and even to a greater extent, as the population increases and the American people find time to pay more attention to what they eat. It is our firm belief that the poultry business is destined to increase and improve and grow more profitable in all branches from year to year.

The editor has personally visited many large and successful poultry plants located in the east, including broiler plants, duck ranches and egg farms. We have visited boiler ranches where from ten to twenty thousand chicks are produced each season, duck ranches where from fifteen to twenty-five thousand ducks are produced annually and egg farms where Leghorns and Plymouth Rocks have been induced to average from 175 to 200 eggs per hen per annum in flocks of from 400 to 600. On these large plants incubators and brooders are used exclusively for hatching and raising the chicks and ducklings and here are found the best equipment and the best methods to date. It is a part of the plan of this book to fully illustrate and explain the equipment and methods used on these large and successful plants. We have aimed in this book to provide the most reliable information to date for the guidance of persons who wish to use only one incubator, also those who wish to use anywhere from one to fifty incubators. And the same is true of brooders. We have aimed to provide information explaining the successful use of one or two brooders, also information for the brooding and raising of hundreds and even thousands of chicks and ducklings by artificial means.

It is a surprising fact that up to the time this book appeared a work on the subject of Artificial Incubating and Brooding, that is, a practical work, strictly up-to-date and contributed to by the most expert authorities in the country, had not been published. The writer, who for three years was in the incubator business, and who during nearly five years has been the editor of a popular poultry paper, has felt the need of such a work as this and has been planning to publish one. We wanted a book that would be contributed to by the

very best authorities in the country, by men who have spent many years in actual work with incubators and brooders, not only those manufacturing and using them experimentally and practically, but also men who are making their living by the practical use of incubators and brooders. Such a book we now offer to the public, and we are free to say that we believe the reader will find this book to be the greatest work ever compiled on the subject of Artificial Incubating and Brooding. Not one of the experts on whom we called for assistance refused us, and they have given us their very best work. What they say can be relied on as the best information and advice to date and it is our earnest hope that every man or woman who reads and follows the instructions given in this work will succeed abundantly and find poultry raising by artificial means a profitable and satisfactory occupation. No doubt when we come to issue a second edition of this work, as is our intention, we shall be able to add to it and improve it, but expense has not been spared to make this first edition as trustworthy and helpful as possible. The readers of the book are to be its critics. Any suggestions from them that will tend toward the improvement of later editions will be welcomed and appreciated. The person whose work it has been to compile this book is a firm believer in poultry for profit and is glad to be thus permitted to contribute something toward the advancement of the poultry industry along practical and enduring lines.

Permit us a word of warning to every reader of this book who may decide to embark in any branch of the poultry business. BE RESOLVED NOT TO SPEND A DOLLAR OF YOUR MONEY FOOLISHLY. Too often persons who decide to go into the poultry business count on fabulous profits and proceed to spend their capital on the basis of these profits. It may be natural enough for them to conclude that inasmuch as the profits are going to be so great, they are justified in spending their money lavishly; but this is a mistaken idea. The profits positively will not be large unless good judgment be used, and it is an old and true saying that one of the best ways to make money is to save it. A dollar saved is a hundred per cent clear profit. No matter how fine a poultry house be made, it will not induce a hen to lay two eggs a day. It is a significant fact that the men in the poultry business who are making money are those who have made every dollar go as far as possible and have paid more attention to the quality of the goods placed on the market by them than to red, white and blue poultry houses, ornamented with gold rooster weather-vanes. Men of sense can raise more chickens and better chickens in goods boxes, than men of extravagant ideas can raise in "Queen Anne" poultry houses. IT IS THE RESULTS YOU WANT, NOT STYLE AND SHOW. It is dollars in the bank that you are interested in, not what some local newspaper may say about your poultry plant.

EDITOR.

Quincy, Ill., November 15, 1898.



EGYPTIAN INCUBATORIES.

Semi-Official Report of the United States Consul at Cairo, Egypt, Setting Forth Interesting and Surprising Facts Regarding the State of Artificial Incubating and Brooding as Practiced at the Present Day in the Country of the Nile.

IT is quite generally known that the hatching and raising of chickens by artificial means was first practiced in Egypt. Says Mr. Cyphers, in the opening chapter of his work, *Incubation and its Natural Laws*: "The art of artificially hatching hens' eggs has been known from the remotest ages. Though in Egypt tradition attributes the invention to the ancient priests of the Temple of Isis, it is impossible to determine at what period or to what nation the construction of the first eccaleobion should be credited."

The fact now develops that artificial incubating and brooding is still extensively practiced in Egypt. Some months ago Mr. F. W. Judd, residing at Flint, Mich., wrote to the United States Consul at Cairo, Egypt, asking for information on the subject of artificial incubation in that country to date. In due time he received through the foreign or consular department at Washington, a lengthy and carefully prepared report accompanied by three drawings, outlining the ground plan of a present-day Egyptian incubatory and two sectional views of same, showing the interior construction and arrangement. The semi-official report and drawings are presented herewith under copyright, all rights being reserved:

EGYPTIAN INCUBATORIES

[Report of the U. S. Consul at Cairo.]

[From December, 1895, issue of *Reliable Poultry Journal*.]

The artificial hatching of eggs has been so long practiced in Egypt that the hens have completely abandoned that part of their work to man. It is a regular industry and the professors form a very close corporation, handing down their secrets from father to son. For three months of the year their time is completely absorbed by constant attention at the incubatories.

Although very successful in the work, they never attempt the hatching except during the months of February, March and April. The minimum temperature in Egypt is reached on the 20th of January; after this it steadily rises, and by Easter the hot weather may be expected. This makes the process difficult and the ovens are therefore closed for the year.

The population of Egypt is very dense, about 700 per square mile. This agglomeration fosters the use of large incubatories, turning out each one from 300,000 to 600,000 chicks each season. In some villages there are from three to five of these establishments. They are generally near to some important market place, and each one apparently in the center of a district of about 50,000 population. That is, each one is the center of a circle having a radius of five miles. It is this density of the population that has allowed this system of artificial hatching to become so very successful. At the same time it must be remembered that there is no other, as the native hen never sits on her eggs.

Another important point is that the hatchers do not attempt to rear the young broods. Forty-eight hours after the chicks emerge from the shell they are scattered over the country; overcrowding is thus prevented. This distribution is effected

in a very simple manner. As the incubator is near a market place, word is sent there that on such a day there will be so many young chicks. This news is quickly disseminated among the villages, and on the appointed day the women arrive with their cages and purchase the young chicks, which are generally sold by the hundred for about \$1.50 per hundred. There are also a number of brokers or dealers who take the young chicks to the more distant villages. For this they have cages made from the palm branch. They are divided into two stories, each of which is divided by a partition, so that the smaller division only contains about 250 chicks, thus preventing overcrowding. Two such cages will transport each 1,000 young birds, so that a man with a donkey easily manages 2,000 of them, and by nightfall has probably sold the entire lot at a distance of five or six miles from the establishment.

Once in the villages the chicks become the property of the women, who take great care of them during the first week. For two or three days they are kept in cages in lots of twenty or thirty and fed on broken grain, slightly moistened. At night the cages are taken into the houses and sometimes covered with a bit of cloth. After these first few days the young birds are strong enough to forage for a living; they are then allowed to roam about freely and at night are kept in a sort of oven placed in a corner of the courtyard. This oven is made of unburnt clay and in shape is like the letter U laid on one side. See drawing. The top is slightly perforated. The entrance is closed by a heavy stone to keep off foxes and other vermin.

When the young chicks are fairly feathered they are plucked perfectly clean and slightly greased. This adds greatly to their health, but detracts much from their beauty. It strikes a stranger as something extremely novel to see hundreds of perfectly naked chickens basking in the sun or running about.

It is difficult to get any exact figures as to the number of these incubatories, but judging from those personally known to me, and their distances apart, I should estimate the number at 150 with an average production of 300,000 per season. This estimate must be well within the mark, as the population of Egypt is nearly 7,000,000, and fowls form a very large part of the Egyptian diet, so that 45,000,000 eatable fowls would be a short supply.

The ordinary form of the incubatories is an oblong 100 feet in length by 60 feet in width, the height varying from 12 to 15 feet. Fig. No. 1, though not drawn exactly to scale, shows the general arrangements. The outer chamber A is divided into three rooms, the middle one masking the entrance to the ovens and thus excluding the outer air. The door leading from A into the central hall is very small. B represents the ovens of the upper tier. C is the man-hole; the attendant stands in this and manipulates the eggs. DD are spaces in the central hall for the reception of the young chicks. These spaces are marked off by ridges of dried mud about nine inches in height.

E is the door giving access to the interior of the oven. Around the wall and parallel to it runs a raised ridge six inches in height; between this and the wall the fires are lighted. In the top of the dome is a small aperture about two inches square for the exit of smoke and regulating the heat.

The outer wall, four feet thick, is generally built of sun-dried bricks, the mortar simply mud. The space contained within the walls is divided as shown in Fig. No. 1. The circular ovens are built up and the spaces between them and the wall filled in with bricks and mortar, the same as the outer wall. Each set of ovens, the upper and the lower, is perfectly

placed in the trough between the hall and the ridge, and is lighted at one or more places, according to the degrees of heat required. This is the only means of regulating the heat. Thermometers are not used. The attendants endeavor to keep the heat a trifle greater than that of their own skin.

While the oven is being warmed, notice is sent out to the villages that the establishment will purchase eggs on such a date. The country people arrive with large crates containing from one to two thousand. These are purchased outright by the establishment at the rate of \$4.00 per 1,000.

The floor of the oven is covered with a coarse mat made of

palm leaves; on this a little bran is sprinkled to prevent the eggs from rolling. The attendant changes the position of the eggs twice a day, taking those from near the man-hole and placing them in the outer edge of the circle and *vice versa*. At the end of six days the eggs are held up one by one towards a strong light. If they appear clear and of a uniform color, it is evident that they have not succeeded; but if they show an opaque substance within, or the appearance of different shades, the chickens are already formed. The bad eggs are removed and the others are continued in their places for four days; at the expiration of this time they are again examined and then put back into their places, the same continual shifting from the inner to the outer part of the circle being observed. The doors of the ovens are kept hermetically closed by a small plank well caulked. This is removed in the forenoon and afternoon and once during the night to see that the heat is kept at the proper point.

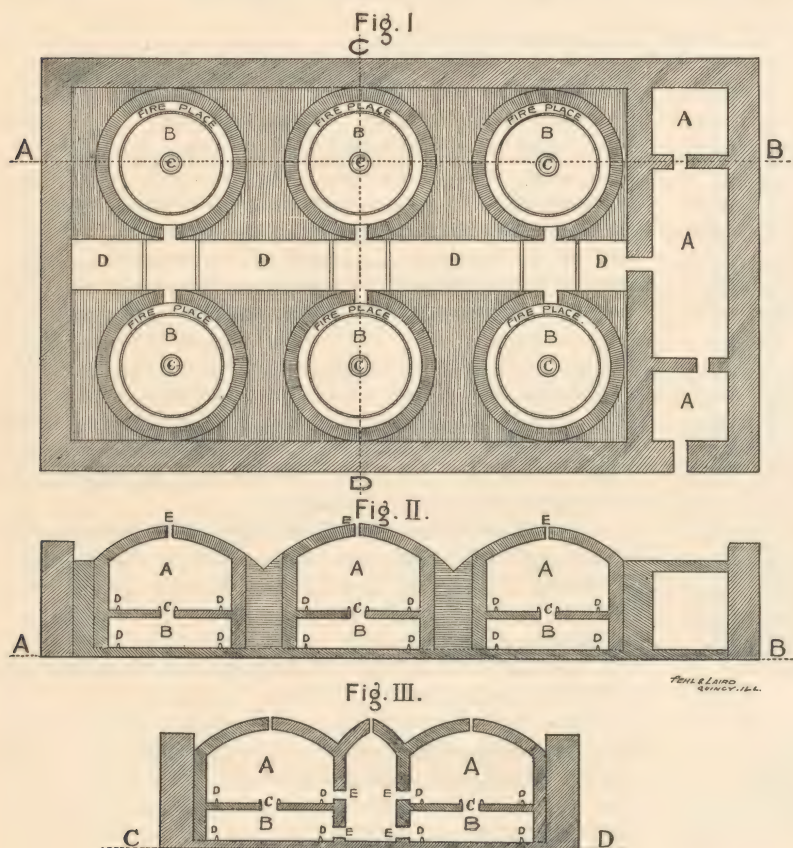
After the eggs have been fifteen days in the ovens they are daily examined, and so delicate is the touch of the attendant that he can at once distinguish if the egg be alive by the fact that it should be slightly warmer than his own skin.

At the expiration of twenty-one days the chicks commence to emerge from the shells, the attendants constantly aiding them. They are placed in the spaces D D Fig. 1 and left to dry for nearly forty-eight hours, but they are not fed. The sale then commences and in a few hours they are spirited away. The temperature in the central hall is maintained at 98 F., and that of the ovens slightly more.

ADDITIONAL FACTS.

"The Egyptian Incubatory of to-day is but a reproduction of the one of thousands of years ago. In all these years the Egyptian breed of chickens has not changed, and the manner of reproduction has remained immutable. Not long since I secured the metal stamp of a chicken, deposited in a tomb over 2,000 years ago and it is a perfect type of the Egyptian fowl of to-day, and when this stamp was struck, artificial incubation was a thing of actual existence in Egypt.

"Not only are the eggs put through the process of incubation more cheaply here than anywhere else in the world, but chicks are reared at an expense past comprehension, while disease and natural death among fowls, because of tireless care, are almost unknown. One man and a boy are the sole attendants of the Incubatory I explored. * * * Think of 234,000 chicks owing life alone to the tender care, in three months' time, of an old man with most defective eyesight and a 16-year-old boy, and some conception may be had of the economies of this Egyptian industry."—U. S. Consul General Cardwell, *Scientific Am. Supplement*, Nov. 29, 1890.



PLANS OF EGYPTIAN INCUBATORY.

(AS FURNISHED BY THE UNITED STATES CONSUL AT CAIRO, EGYPT.)

KEY TO ILLUSTRATION: Fig. I.—Ground plan. A A A, rooms masking entrance to incubatory. B B B, ovens where eggs are hatched. D D, hallway. C C, man-holes admitting attendants to upper tier. Fig. II. Sectional view lengthwise. A A A, upper chambers to ovens. B B B, lower chambers. C C C, man-holes. D D, fire spaces. Fig. III.—Sectional view crosswise—same lettering as for Fig. II.

independent and is covered by a dome having a very small aperture in the crown.

Fig. No. 2 represents the elevation on the line A B of Fig. 1. The height of the lower oven is four feet, that of the upper one nine. The interior diameter between the ridges D D is fifteen feet.

No. 3 represents the elevation on the line C B of Fig. 1, and shows the disposition of the central wall and the doors of the ovens. For this particular incubatory the attendants consist of two men and a boy.

In the month of January, about the 10th, fires are lighted in all the ovens and on the floor of the central hall. The entire building is thoroughly warmed to a temperature of 110 degrees Fahrenheit. This heat is continued for three weeks, when the temperature is allowed to fall to 100 degrees Fahrenheit.

The fires are at first composed of gelleh or dried cow dung, but when the eggs are placed in the oven coarse broken straw, mostly the joints, and sheep or goat dung is used. The fuel is

NATURAL LAWS OF INCUBATION.

A Semi-Scientific Treatise on the Natural Laws and Conditions Which Must be Conformed to in Order to Achieve the Maximum of Success in Hatching Eggs by Artificial Means.

BY CHARLES A. CYPHERS.

Author of "Incubation and Its Natural Laws," Inventor of the Cyphers Incubator, and President of the Cyphers Incubator Company, Wayland, N. Y.

THE first factor to be considered in artificial incubating and brooding is GOOD EGGS. The possibilities of successful incubation are far ahead of those of successful brooding, as we can now place eggs under so nearly perfect conditions, that we can do quite as well as the old hen in hatching, and even get out a larger percentage than an average lot of hens; but in brooding, the old hen seems to be still in the lead, under favorable conditions. The incubation of an egg is a mechanical process, and if the physical laws which control it are thoroughly understood, we can supply the needs perfectly by mechanical means, but in the artificial brooding of the chick we substitute an inanimate for an animate body, and can not supply the keen instinct which old biddy displays in caring for the individual wants of her brood, and especially of the weaker members of it. We can supply the mechanical requirements of hatching, because they are practically one—we guard against outside influences and keep a certain fixed condition within a limited body a few feet square. In brooding and raising chickens, we cannot make an animate body to move around with them, to let the strong forge ahead, and coddle and feed the weaker ones and nurse them along until they have vitality and pugnacity enough to fight their way to maturity.

The vicissitudes of temperature outside of the brooders, coupled with a disinclination of a part of the brood to eat and care for themselves, are what make artificial raising so hard, and it is impossible to make an animate body to coddle these weaklings along. It is very obvious, therefore, that the smaller number of weaklings we have, the larger will be the percentage we may expect to raise. While there are machines that are so poorly designed to meet the proper requirements of incubation that the chicks do not mature *well ripened*, no machine can hatch a strong, vigorous chick from an imperfect egg, so I say, the egg is the first thing to be looked to, to see that we have strong chicks to brood after they are hatched, and not a lot of weaklings that will need coddling and nursing, for it is the percentage we raise successfully that tallies on the side of profit.

Various manufacturers have put out machines that can but imperfectly do the work for which they were intended, but are yet capable of hatching a percentage of the best eggs, and when their customers complain of poor hatches, the whole

blame has been thrown on the eggs. If the chicks could not be raised in their brooders it was the fault of the eggs and not the brooder, which might be of ill-design. The old operator knows by experience just how far the trouble should be laid to the eggs, the incubator, or the brooder, as he compares the present with the past, and he thus has the key to the situation. The young operator, the beginner, however, has no past experience with which to compare the present, and he often secures poor tools to work with, from the egg to the machine with which he attempts to incubate it, and the brooder to which the chick is intrusted. The consequence is that after being buffeted from pillar to post for a season he finds at the close that he has a handful of miserable looking chickens, which feel more miserable than they look, a depleted bank account, (if he had one,) a lot of bills to meet and nothing with which to pay them. Then the cry goes up in the neighborhood "So and so failed in the chicken business. There is nothing in it." So it is well for the beginner to select his tools with care if he wishes to succeed. That he can succeed is proved by the success of hundreds who are making money out of the business.

When designing to secure good eggs, we need to go back of the care and feed, to the blood. We can not take a flock of inbred scrubs, the brothers and sisters of which have been interbreeding for years, and expect to secure eggs that will hatch strong chickens. With a per-

fectly constructed machine we can coax a percentage of these eggs to hatch, but we have no animate body to coax and coddle the little weaklings into trying to make a live of it.

In selecting the breeders, do not haggle too much on price, neither try to buy too many fancy points, but secure your stock from some breeder who has for years been breeding for strong, vigorous birds, and who has raised his flocks on *free range*. This latter factor is of as much importance as good blood. There is a wide difference in the eggs from stock raised on free range and those from the hen that was restricted and pampered when growing. It is often necessary to confine the layers to a limited run during the breeding season, and just as good results can be secured, provided the stock was allowed free range when growing.

Having selected a good vigorous pen of birds, our next step is to keep them in the best of health by proper care and feeding. It is not necessary to erect elaborate laying houses,



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but it is necessary to have a good warm roosting room, not so very large, and a goodly-sized scratching shed, open to the south to make a warm shelter out of doors—a play-ground for the birds, as it were, where they can get fresh air and exercise during the stormy weather of the winter months, without being exposed to the cold rains and colder winds.

Plans are now designed for building correct laying houses so cheaply that there is no excuse for quartering breeding stock in ill-conditioned buildings. If you can not start in the business with the first elements of success in your favor, it is best not to start at all. It is very often not so much the lack of money, as a very few dollars, coupled with a large stock of push

Clover is one of the most healthful stimulants that can be given to fowls. It should be cut about one-fourth inch long, not ground in powder, as one of its values is the bulk it gives to an otherwise soggy mash. Cabbage, turnips and potatoes can be fed as a change. Eight to ten per cent meat scraps should be given. Green bone contains a large percentage of fat, in not as digestible a form as secured in corn, while lean meat, such as horse flesh or pressed beef scraps, gives the nitrogenous food that meat is designed to supply. Both green food and meat are necessary to perfect egg production, and eggs from confined stock not supplied with them are worthless for incubation. During the cold weather care should be taken

that the eggs are not chilled. Only perfectly formed eggs should be selected for incubating. Thin-shelled or odd, irregularly-shaped eggs should be sent to market. The very small and very large ones should also be discarded. Having secured the best eggs possible, select an incubator that meets the natural conditions. The two principal factors of the incubation of an egg being warmth and fresh air, we will consider something of their properties. It must be remembered that from the first moment the germ commences to incubate it becomes a living animal and is subject to the same laws which control growth after exclusion, though limited in its powers and dependent upon external influences.

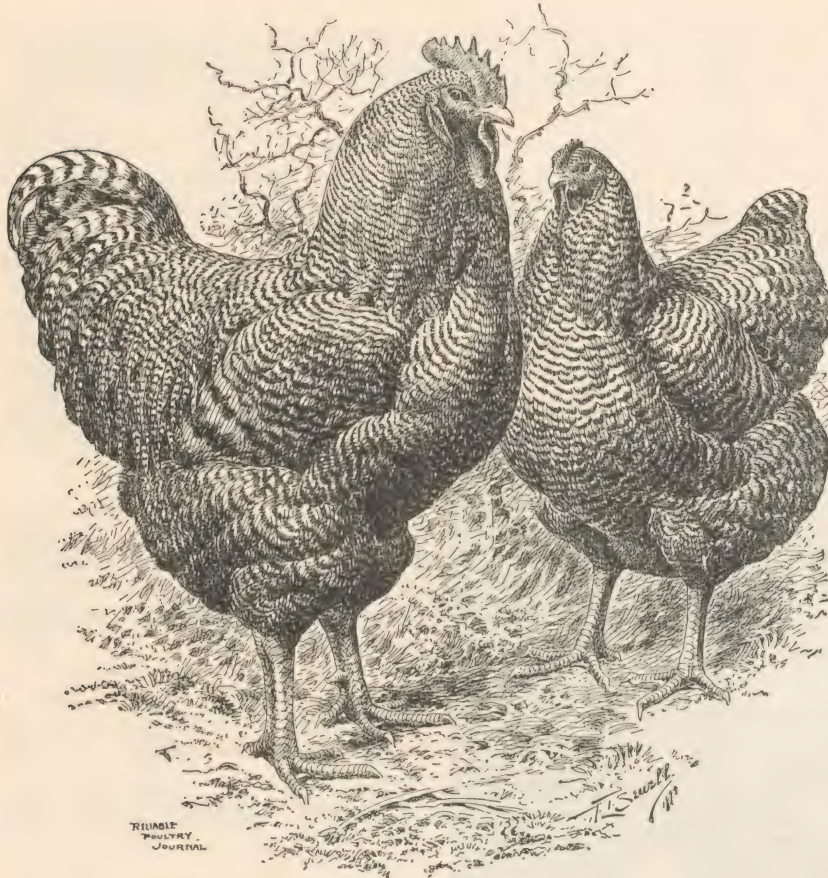
NATURAL INCUBATION.

In order to understand the requirements of artificial incubation we shall need to first consider the observed facts in relation to the natural processes, by a comparison of which the general principles common to all may be deduced. If left to herself a hen will prepare a shallow receptacle for the eggs, to aggregate them in a space that may be covered by the incubating body and kept in the warmth.

When a hen becomes broody after laying a clutch of eggs the plexus (net work or interlacement of blood-vessels) of the organ of incubation is developed, which consists of an arterial plexus ramifying beneath the integument of the abdomen, and form, by their unions, a rich network of vessels which becomes truly extraordinary in the time of hatching. Thus the warm blood is brought to the surface which is opposite the eggs, bringing the latter to a temperature that approaches more nearly to that of the blood of the fowl than they would otherwise be brought.

After this preparatory stage a hen sits on the eggs more or less constantly for about twenty days, from time to time moving them about in the nest, probably adjusting them to her own comfort. As a rule the larger number of a sitting of eggs will become arranged in a circle, with the broad ends forming the circumference. This seems to be due to the hen's turning or shifting her position on the eggs, and to the shape of the body of the hen and of the egg itself. During the latter stages of incubation the broad end becomes very slightly elevated, which is due in part to the nest becoming more hollow, and to the bulk of the contents of the egg being situated in the small end, making that portion of it the heaviest.

In settling on the nest the hen makes a slight movement with the body from side to side which partially separates the eggs and forces them out in the feathers, only a comparatively small surface of each egg coming in contact with the incubating body. Over a greater part of that portion of the egg opposite the hen's body a layer of down and feathers intervenes,



BARRED PLYMOUTH ROCKS.

STANDARD WEIGHTS { Cock, 9½ pounds; Cockerel, 8 pounds.
Hen, 7½ pounds; Pullet, 6½ pounds.

Characteristics—Cost of raising to maturity, \$0.75. Annual cost of keeping, \$0.90. Average egg yield per year, 175. Average number of eggs to pound, 8½. Hardy constitution. They are good as foragers; can stand confinement; are fine as sitters and good as mothers. Grain and flavor of flesh good.

and energy, will make and keep things right from the start.

Having our layers properly housed we need to feed them in such a manner that their digestive organs will be kept in good working order and the material necessary to health and egg production be supplied. First we need fresh water, as without a large percentage of liquid the vital functions can not be carried on. It not only aids digestion and assimilation, but it helps to wash out the impurities of the blood caused by the chemical changes going on in the animal economy. After water comes grit, as without grit no species of bird that feeds on grain can digest its food properly, a large proportion of it going to waste.

Corn should form at least one third of the food. Corn is the most easily digested grain food, and forms the basis for egg production, when aided by the proper accompaniments, green food and meat. Wheat has good feeding value and should form another third of the grain ration. Green food, such as boiled clover, should form about twenty-five per cent.

which also covers the outer end and the remaining portion of the surface. Many times the feathers on the abdomen either fall or are plucked off during incubation, and the eggs are then brought into direct contact with the warm body.

The number of times the hen will leave her nest, as well as the period of remaining away from it, varies with different hens, and the state of the weather. In very warm weather the hen often rises in the nest and throws her feathers out to cool her body, thus partially uncovering the eggs. If the weather be excessively warm during the latter stages of incubation the chicks will often be found dead in the shell. For a few hours before first breaking the shell the labored breathing of the chicks can be heard, with an occasional pip and chirp, and the eggs sweat. After exclusion the chicks at first sweat profusely, are highly sensitive to the slightest current of air, and huddle close to the hen's body for warmth.

APPLYING HEAT TO THE EGGS.

In natural incubation the eggs are thus placed beneath a heat-generating body, and covered in with down and feathers. In this position they are warmed principally by conduction, and secondarily by diffusion or conveyance—both interior and exterior of the shell. An unincubated egg is a very poor conductor of heat. The shell, however, is one of the very best conductors, and to it the more uniform heating of the egg is at first due. In illustration, if a piece of muslin be smoothly wrapped around an egg, it may be held in the flame of a lamp until the whole egg is hardened without the muslin burning, so rapidly does the shell conduct the heat away.

In addition to the high conducting power of the shell, through the rapid development of the vascular system (consisting of blood vessels), the blood circulation soon aids in the distribution of the external warmth. Moreover, in natural incubation we have supplementary external aids of considerable value; *i. e.*, the tendency of the heated air to diffuse downward through the feathers covering in the eggs, as well as outward, and of the feathers to hold, entangled around the eggs, a comparatively large volume of warm air. The air in contact with the heating body becomes warmer than the outside atmosphere, and tends to diffuse outward through the feathers, cooler air taking its place, though any rapid movement is held in check by frictional resistance. Thus it is seen that the heat is to a large extent retained around the eggs by the maze of fluffy feathers.

TEMPERATURE OF THE EGGS

I find the temperature of the eggs will average up at the end of the first day of incubation at about $97\frac{1}{2}$ degrees; at the end of the second day at $98\frac{1}{4}$, and from this time on will gain uniformly one-fourth degree a day until the end of the eleventh day, having a temperature at that time of about $100\frac{1}{2}$ degrees. During the next two days the temperature rises to $101\frac{1}{2}$ or 102 degrees, and remains more or less stationary at 102 until the end of incubation.

The eggs tested were from a mixed lot of hens, and the sitters were common barnyard fowl. The figures given are the average of from five to eight registrations each, and represent, for the most part, the temperature of the great mass of the egg only, the temperature of the blood in the vascular system probably being somewhat higher.

The thermometer used was made especially for the purpose, and contained the least possible mercury, and had the largest amount of surface exposure that it was practicable to

make. The instrument was so delicate that it would register from four to six degrees above the temperature of the air when exposed to the radiant heat an inch from the palm of the hand, and was sufficiently delicate to show a difference of half a degree in different parts of the egg.

GETTING THE TEMPERATURE.

In testing, the egg was removed from the nest and wrapped in warm flannel; a small hole, about one-eighth of an inch in diameter, was cut in the broad end of the egg, and the thermometer, already warmed to 98 degrees, was quickly introduced into different parts of the egg without mixing the contents any more than possible. A correction of two-fifths



WHITE PLYMOUTH ROCKS.

STANDARD WEIGHTS: { Cock, 9½ pounds; Cocker, 1, 8 pounds.
Hen, 7½ pounds; Pullet, 6½ pounds.

Characteristics—Cost of raising to maturity, \$0.75. Annual cost of keeping, \$0.90. Average egg yield per year, 175. Average number of eggs to pound $8\frac{1}{2}$. Hardy constitution. They are good as foragers; can stand confinement; are fine as sitters and good as mothers. Grain and flavor of flesh good.

of a degree was allowed, which probably more than covered the amount of heat lost. A difference of half a degree could be detected between the temperature of the center of the egg and the parts near the surface, while one side seldom registered as much as one-fourth degree higher temperature than the opposite. Only eggs that were well covered were taken, and only those containing live germs counted. Infertile eggs ranged from 96 to 93 degrees throughout the hatch.

The one or two fertile eggs left in the nest in each sitting hatched by or before the close of the twenty-first day, and in all but three dead germs were found. All the eggs showed a remarkably uniform temperature at the different periods, seldom varying as much as one degree either side of the figures given.

Notwithstanding the delicacy of the thermometer used, it is probably impossible to get the temperature in the region of the germ-spot, or later of the blood in the vascular system

before the twelfth day, with so crude an instrument as a thermometer. The egg undoubtedly attains a superficial temperature at first of 100 degrees over that portion which is in immediate contact with the incubating body, and during the first days of incubation the germ must partake of that temperature to a greater or lesser extent, as it lies immediately beneath the shell in the neighborhood of that portion which is nearest the source of warmth.

THE MAXIMUM TEMPERATURE.

The great body of the egg, however, does not reach its maximum temperature until the twelfth or thirteenth day. By this time the allantois (a membranous sac-like appendage, for effecting oxygenation and other changes in the blood,

about 109; by the end of the second week it will have fallen to 108; and sometimes by the end of the third week to 106 degrees. One hen with a rectum temperature of 106 at the end of incubation was killed the fourth day following, and was found to have a temperature in the region of the heart of 110.

RELATIVE POSITION OF THE EGG.

During the early stages of incubation the eggs cannot be said to be, to any great extent, in direct contact with the incubating body, as a layer of down and feathers intervenes; but, as incubation progresses, the feathers covering the abdomen either fall or are plucked off; so that, notwithstanding the greater body temperature of the hen at the commencement of incubation, the temperature of the surface which imparts the warmth to the egg is not much inferior during the latter stages of incubation to that of the earlier, owing to the change in the relative position of the egg, and to the greater advancement of the incubating plexus, which brings more and more warm blood to the surface of the abdomen.

The eggs themselves develop very little heat up to the eleventh day. By the eleventh day the structural development of the chick is about complete, and from this time on less external warmth is required to maintain its temperature, a small amount of heat being now developed by the chick in the absorption and oxidation of the remaining nutrient material. The chick is growing rapidly, and some little excretion is appearing in the allantoic fluid (fluid enclosed by the allantois) and in the intestines.

HIGHER SUPERFICIAL TEMPERATURE.

Although up to the twelfth or thirteenth day the great mass of the egg has a somewhat lower temperature than 102 degrees, it is probable that it has a superficial temperature in the neighborhood of the germ of from 100 to 100½ degrees even at the first. This assumption is based upon the fact, noted from a series of careful experiments, that if the eggs are maintained at a temperature rising from 98 to 100 degrees, the development at seven days is from twenty-four to thirty-six hours behind that of the same period under natural incubation. When the eggs are incubated at an initial temperature of 100½ degrees, gradually rising to 102 by the eleventh day, and maintained at that degree for the balance of incubation,

the chicks are usually all excluded by the middle of the twenty-first day; that is, if the eggs are not subjected to too frequent and prolonged exposure to a cold atmosphere. In the latter case the eggs will need to be maintained at a higher temperature during the entire period. When the eggs are maintained at a temperature of 100½ to 102 degrees, and subjected to little or no exposure to a cold atmosphere, the embryonic development is found to correspond approximately to that under natural incubation.

The reader will bear in mind that the temperature of the egg is spoken of, and not that registered by the thermometer.

COOLING THE EGGS.

If an abundance of food and water is placed where it will be accessible to the hen when she leaves the nest, it will be found that, if left to herself, a successful sitter remains on the eggs two, three and even four days at a period without leaving them. In exposing eggs to the atmosphere two facts must be taken into consideration. When the hen returns to the nest the eggs quickly regain their normal temperature; while,



SILVER LACED WYANDOTTES.

STANDARD WEIGHTS { Cock, 8½ pounds; Cockerel, 7½ pounds.
Hen, 7½ pounds; Pullet, 5½ pounds.

Characteristics—Cost of raising to maturity, \$0.70. Annual cost of keeping, \$0.80. Average egg yield per year, 175. Average number of eggs to pound, 9. Average constitution. They are good as foragers; can stand confinement; are fine as sitters and good as mothers. Grain and flavor of flesh good.

developed from the hinder part of the alimentary tract in the embryo of mammals, birds and reptiles) extends three-fourths of the way around the egg, and its blood-vessels lie immediately beneath the chorion (the membrane which encloses the contents of the egg after incubation starts) and shell membranes, while the vessels of the yolk-sac have nearly enclosed the yolk. It will thus be seen that the heat applied to any one portion will at this time be rapidly diffused by the blood throughout the contents of the egg.

TEMPERATURE OF THE HEN.

If during the first few days of incubation we place a suitable thermometer beneath the hen, in about the same position as the eggs are placed, there will be imparted to it a temperature of about 101 degrees only, although a glass placed in the rectum will register from 109 to 110, and if the hen is killed without bleeding, an opening quickly made through the side, and a delicate thermometer thrust into the region of the heart, it will register from 112 to 112½ degrees. By the end of the first week of incubation the temperature in the rectum will be

when the eggs are removed from an incubating chamber under artificial incubation, they are some time warming up when replaced. It has been held that the eggs need to be cooled in order to absorb fresh oxygen, but this view arose through ignorance of the laws controlling the movement of gases, and is entirely fallacious. It is well, however to cool the eggs when incubating during warm weather, or else run the temperature a trifle lower.

APPLICATION OF HEAT.

As was shown in an earlier part of this article, 100½ degrees at the initial stages, gradually rising to 102 degrees by the eleventh day is probably the correct incubating temperature for hen eggs. We have now to consider how we are to maintain them at that temperature. The atmospheric conditions to be maintained during incubation will be discussed under the head of ventilation.

In artificial incubation an equable distribution of heat over a comparatively large surface is first to be desired. This is very difficult of attainment, the reasons for which are obvious.

In the first place, as a basis of discussion, let us take an incubating chamber say thirty-six inches square, twelve inches in height with egg trays placed five inches from the bottom. Such a chamber will hold 360 duck or 400 chicken eggs. This is as large as it has been found practicable to make a hot-air machine, and about as small as it is economical to make one heated through the agency of hot water. We will say the heating body comprises the entire upper surface of the chamber.

AN UNEQUAL TEMPERATURE.

We will now suppose the heating surface has been brought to a uniform temperature by some means, and all the direct heat rays given off of equal energy. If we now place several thermometers in the machine, and note their temperature, we will find those in the center registering the highest, those a little farther towards the sides a lesser temperature, and those nearest the sides the lowest. It is evident that the sides are giving off less radiant energy than they are absorbing, causing a loss of heat to the chamber. As it is quite impracticable to make a case that is a perfect non-conductor, we shall always have this feature to contend with.

The loss of heat energy is felt to the greatest extent in that portion of the chamber near the sides, for the reason that radiant heat diminishes in intensity as the square of the distance from the radiating surface increases. The distance being the greatest at the center of the chamber from the surface where the loss of warmth occurs, that portion is the least affected.

EQUALIZING THE RADIANT ENERGY.

We will now consider the effect of equalizing the radiant heat within the chamber by creating inequalities of temperature in the heating body. This may be done for any particular temperature, by directing the flow of hot water or air over the heating body, but the same inequalities will not answer for all temperatures. For instance, we will say that the temperature of the air around the machine is 80 degrees, the highest atmospheric temperature in which any machine should be operated.

At this temperature the loss of warmth through the medium of the walls or casing of the chamber is at its minimum. We now direct the flow of hot fluid in such a manner that it warms the heating body near the walls of the chamber to a

certain degree of temperature above that at the center, the temperature of the intermediate points being graduated proportionately. If we have correctly estimated the difference in temperature required, we will now find that the greater radiant energy given off by the heating body near the walls of the chamber offsets exactly that which is absorbed, and thermometers now placed in different parts of the chamber will show that they are all receiving the same amount of radiant heat.

We will now take this machine, the hatching chamber of which was equally heated when surrounded by an atmospheric temperature of 80 degrees, and place it under an atmospheric temperature of 35 degrees, about the lowest tempera-



WHITE WYANDOTTES.

STANDARD WEIGHTS { Cock, 8½ pounds; Cockerel, 7½ pounds.
Hen, 7½ pounds; Pullet, 5½ pounds.

Characteristics—Cost of raising to maturity, \$0.70. Annual cost of keeping, \$0.80. Average egg yield per year, 175. Average number of eggs to pound, 9. Average constitution. They are good as foragers; can stand confinement; are fine as sitters and good as mothers. Grain and flavor of flesh good.

ture in which any machine should be operated. The loss of warmth is now at its maximum, and we find that the greater warmth of the heating body near the walls of the chamber no longer offsets that absorbed. We shall therefore need to increase the inequality of temperature of the heating body under the new conditions. It is thus obvious that an incubating chamber can not be constructed so that it will maintain the eggs at an equable temperature under all conditions, and that the best we can do is to construct the chamber so that it will have an equable temperature when placed in the mean of the atmospheric temperatures in which it is going to be operated. If this is done, and the walls are properly constructed, the greatest variation need not be more than a degree, or possibly a little less. The corners will show the greatest variation, for the reason that the surface of absorption (the wall area) is relatively larger at these points than the surface of the heating body.

To offset any differences in temperature, the relative position of the eggs should be reversed. This may be quickly

done by simply turning the trays around so that the cool side takes the place occupied by the warmer. If this is done twice a day, say when the eggs are turned, a difference of a degree in temperature will do no harm. Even greater differences of temperature in the different parts of a machine may be offset, to a great extent, by shifting the location of the different trays.

THE HEAT MUST BE REGULATED.

Let us suppose the hatching chamber to have an equable temperature, and the temperature of the heating body, as well as that of the outer atmosphere, to remain stationary throughout the entire period. From our present point of view all the eggs would thus be under perfect thermal conditions if they were at the proper temperature to start with. This is practically a theoretical condition, for in practice we will need to regulate the temperature of the heating body so that the heat given off

the tube ages they register half a degree or more high. This will not make much difference if we know what the correction is. In scientific work requiring their use the thermometers are always tested from time to time, and the correction ascertained. After a thermometer is a year and a half or two years old, further aging will change it very little. A new glass will change the most during the first six months, at which time some manufacturers graduate and place them on the market.

There should always be a good standard thermometer on every place, so when a new glass is bought, it will be easy to learn the correction, if any, and to test it from time to time afterwards. A good way to test a thermometer is to place it, together with one known to be correct, in a body of water which has been previously heated to 105 degrees. Allow the water to cool down gradually, and note the temperatures of the two as they fall through five degrees. The water will need to be continually stirred, for otherwise all kinds of temperatures can be detected in it, and we would not know when the two thermometers were receiving a like amount of heat.

THE TEMPERATURE OF THE EGG.

To ascertain the temperature of the egg without breaking it is impossible with the use of the thermometer. If we place a thermometer so that its bulb rests upon a fertile egg, it does not necessarily give us the temperature of all the eggs, or even the majority of them. Nevertheless, it is the best way to run a machine in which the eggs are warmed by radiated heat. In machines in which the eggs are heated by simple contact with warm air, a hanging thermometer, the bulb of which is suspended half an inch above the eggs, will give the general temperature of the chamber, which should in this case be run at 102½. This gives an egg a temperature of 100 degrees at the start, and 102½ to 103 at the finish, which give the best average results.

The means to be employed to keep the chamber at a constant temperature must rest with the manufacturer. The regulator should be simple and effective. The application of heat and the regulation of temperature in artificial incubation should be made as uniform as it is possible to make it. There are atmospheric conditions that are of equal importance as an even temperature, and which are equally as hard to maintain, and if we allow one condition to vary here, and another there, we can not expect to get the best results. In fact,

unless there is an equal balance between the heat and atmospheric conditions, incubation cannot be carried to a successful exclusion.

There is a certain incubating temperature to be maintained for the best possible results to be produced, and certain mechanical and atmospheric conditions to be observed from the time the egg is laid until the exclusion of the chick. Simply because a puppy will live for fifty minutes under water, are we to leave him out in every shower; or, because the human body can exist under a temperature of 300 degrees in a dry air, do we wish to run the temperature of our living rooms up to that degree two or three times a day? The vicissitudes of temperature, climate, and other conditions under which living organisms will continue to exist, are extreme, indeed, and the limitations are usually proportioned to the changes the individual has normally to withstand; but in all organic life the highest development is only attained under particular,



LIGHT BRAHMAS.

STANDARD WEIGHTS { Cock, 12 pounds; Cockerel, 10 pounds.
Hen, 9½ pounds; Pullet, 8 pounds.

Characteristics—Cost of raising to maturity, \$0.95. Annual cost of keeping, \$0.90. Average egg yield per year, 150. Average number of eggs to pound, 7. Hardy constitution. They are fair as foragers; can stand confinement; are heavy as sitters and clumsy as mothers. Grain and flavor of flesh fair.

by it will be just sufficient to offset that lost by the chamber when placed under various outer atmospheric temperatures. We can reduce the temperature of the air and eggs without reducing the temperature of the heating body by giving more ventilation, and thus replace the warmer air with that of a lesser temperature; but this method is not a desirable one, the reasons for which will be cited when considering the subject of ventilation.

Before considering the regulation of the temperature of the hatching chamber, however, we will need to know when its temperature is at the desired degree; or what is of more importance, and sometimes considerably harder to ascertain, what is the degree of temperature of the eggs.

A GOOD THERMOMETER.

To start with, we shall need to secure a good thermometer. Many comparatively new glasses are still put out, and after

narrow, and usually well defined limits. The incubator, therefore, that has the best regulator for maintaining an equal temperature has a long advantage over its competitors in hatching strong, healthy chicks.

VENTILATION.

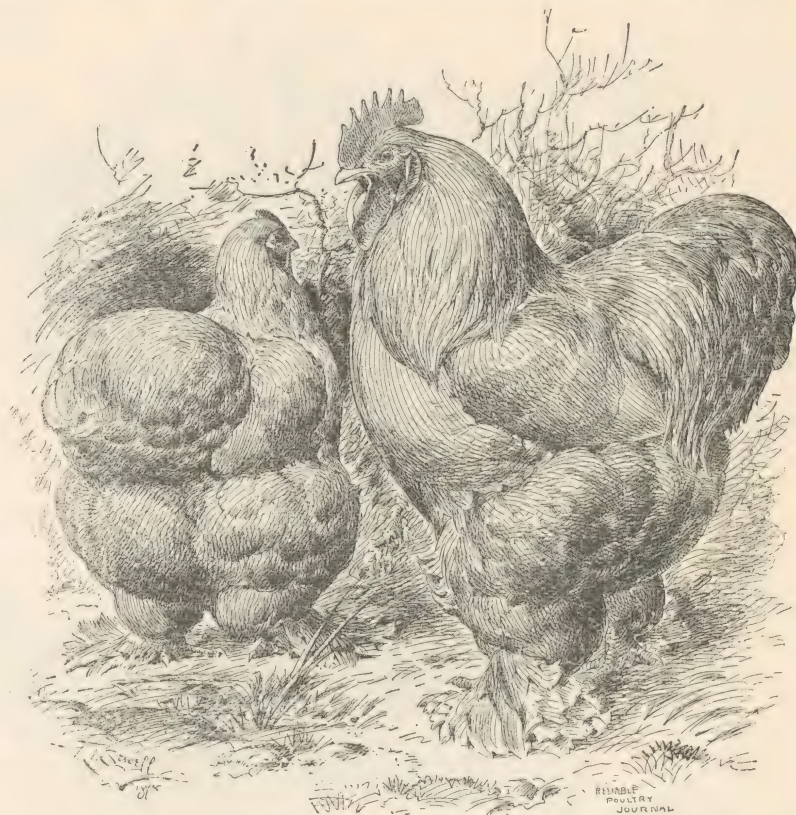
In natural incubation the eggs are placed in a respirable fluid which surrounds the earth and forms its atmosphere. This fluid, which is known as the atmospheric air, is composed by volume of twenty one parts of oxygen and seventy-nine of nitrogen. Air also contains 1-2500 volume of carbon dioxid, some aqueous vapor, and small, varying amounts of ammonia, nitric acid, ozone and organic matter. Its constituent gases are not chemically united, but are mixed mechanically. It may be spoken of as oxygen diluted with nitrogen, the oxygen being the active and the nitrogen the neutral body. When air is inhaled into the lungs the oxygen is separated from the nitrogen. It unites with the carbon in the blood and is expelled as carbonic acid gas, more properly called carbonic anhydrid or *carbon dioxid*, a gaseous compound of twelve parts by weight of carbon and thirty-two of oxygen. Diffusing inward through the shell, the air reaches the covering membrane of the egg, which, being thin and moist, offers no serious impediment to its passage inward, the transmission being effected with perfect ease. A partial separation, however, is effected, for, whereas atmospheric air consists of twenty-one volumes of oxygen and seventy-nine of nitrogen, air contained in the egg contains about thirty-three per cent of oxygen.

If an egg be varnished over before incubation commences, and the air thus excluded, there will be sufficient oxygen already within the shell to suffice for the development of the blastoderm (that portion of the ovum from which the organs of the embryo are formed), up to about the fifteenth hour of incubation, and the life of the germ is not destroyed until between the twenty-fourth and thirtieth hour, but a fresh supply of oxygen is essential to further development. That is, in order that the nutritious yolk may be afforded to the nutrition of the embryo, it is necessary that it should undergo some changes in which the atmospheric air is concerned, as in the germination of seeds, and during the development of the embryo its blood requires aeration as much as that of the adult animal. In nearly the whole stage of development there is a general or interstitial (pertaining to an interstice or narrow space between parts of the embryo) respiration, or a change essential to life, produced by oxygen in all the substances of the embryo and of its accessory parts, which, as the embryo is more perfectly formed, takes place more actively in particular organs only. As soon as a peculiar nutritive fluid and a central propelling organ are produced, this fluid is exposed on the expanded surface of the yolk to the influence of the oxygen absorbed in the albumen. This blastodermic expansion, or vascular area, throws out villi (hair-like processes found on certain membranes) from its under surface to absorb the yolk, which, in a partially assimilated condition, is transferred to the blood-vessels that ramify over its surface. Thus it acts as the organ of circulation, respiration, and nutrition.

As the vascular area rapidly spreads over the yolk, it continues to act as the chief organ of absorption and digestion, but its importance as a respiratory organ gradually diminishes. In its stead a special respiratory and excretory organ (an

organ for getting rid of waste matter) is developed in the allantois. The allantois also serves a nutritive function, for by it the denser portion of albumen is ultimately enclosed and absorbed. It is very vascular, and until the last few hours serves as the chief organ of respiration, the oxygen gaining access to it through the coverings of the egg, with which it is in contact.

The passage of carbon dioxid and hot watery vapor out of the blood, and of oxygen into it, is the essence of the respiratory process and thus a membrane with blood on one side, and oxygen on the other, is all that is absolutely necessary to effect the purification of the blood. Blood holds in



BUFF COCHINS.

STANDARD WEIGHTS { Cock, 11 pounds; Cockerel, 9 pounds.
Hen 8½ pounds; Pullet, 7 pounds.

Characteristics—Cost of raising to maturity, \$0.85. Annual cost of keeping, \$0.90. Annual egg yield per year, 140. Average number of eggs to pound, 8. Average constitution. They are poor as foragers; can stand confinement; are fair as sitters and mothers. Grain and flavor of flesh poor.

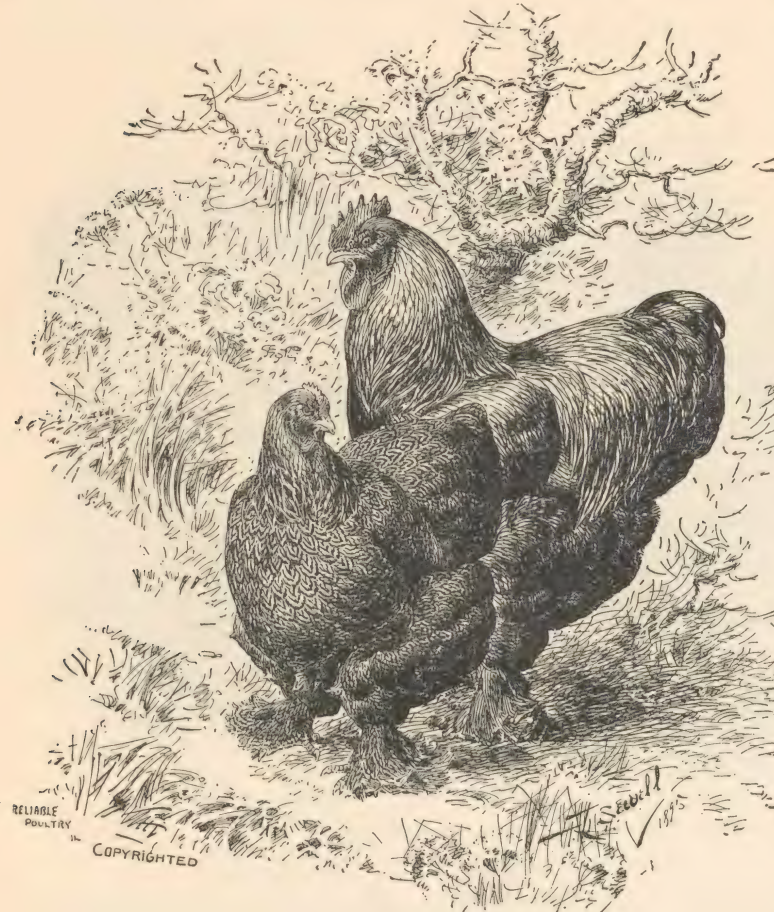
solution rather less than half its volume of gases, two-thirds of which is carbon dioxid, less than one-third oxygen, and not one-tenth nitrogen. It contains rather more oxygen gas than could be held in solution by water, not in a free state but held in some sort of loose chemical combination with a constituent of the blood. The functions of the blood are to supply nourishment to, and take away waste matter from all parts of the body. It is absolutely essential to the life of every part of the body that it should be in such relation with a current of blood that matters can pass freely from the blood to it, and from it to the blood, by diffusing through the walls of the vessels in which the blood is contained.

VENTILATION A VITAL NECESSITY.

Carbon dioxid is constantly generated in the body, and is, therefore, to a certain extent, one of the natural constituents of the blood; but, when not promptly thrown off, its action becomes quickly injurious. When an egg is covered with an impermeable varnish, or the mutual diffusion of the gases on either side of the shell is in any way sufficiently prevented, what is called asphyxia takes place, and the embryo soon dies. This is caused by lack of oxygen and excess of carbon

dioxid in the blood. It is not necessary to close the pores of the shell to bring on asphyxia, but this condition can be effected either wholly or in part by decreasing the proportion of oxygen, or increasing that of the carbon dioxid in the surrounding medium.

The proportion of carbon dioxid naturally existing in the atmosphere may be assumed as inoffensive, but all increase is more or less deleterious. A cubic foot of air of average purity contains a little less than a cubic inch of carbon dioxid. When this amount is increased to eight or ten per cent, the vital activity is sluggish, and when raised to twelve or fifteen per cent it is speedily destructive to the life of the germ.



PARTRIDGE COCHINS.

STANDARD WEIGHTS { Cock, 11 pounds; Cockerel, 9 pounds.
Hen, 8½ pounds; Pullet, 7 pounds.

Characteristics—Cost of raising to maturity, \$0.85. Annual cost of keeping, \$0.90. Average egg yield per year, 120. Average number of eggs to pound 8½. Average constitution. They are poor as foragers; can stand confinement; are heavy as sitters and clumsy as mothers. Grain and flavor of flesh fair.

The cause of this is obvious. Other things being alike, the rapidity of diffusion between two gaseous mixtures depends on the difference of the proportions in which their constituents are mixed; it therefore follows that the more nearly the proportion of carbon dioxid on one side of the membrane approaches that on the other, the slower will be the diffusion of carbon dioxid outward, and of oxygen inward, and the more charged with carbon dioxid and defective in oxygen will the contents of the egg become. And, on increasing the proportion of carbon dioxid in the outer air, a point will at length be reached when the change effected is too slight to relieve the respiratory blood of its carbon dioxid, and to supply it with oxygen to the extent required for its aeration.

Thus we can appreciate the vital necessity of ventilation, or the purification of the air surrounding the egg; which is essentially the dissipation of the carbon dioxid exhaled, and the replenishing of the oxygen consumed. The purification

of the general atmosphere is maintained by various agencies of nature. By the law of diffusion all gases intermingle, so that where impurities are set free at any point they tend to diffuse away, and thus become weakened or lost in the great body of the atmosphere. The mixture of large masses of air and the dispersion and dilution of local impurities are also affected by the winds. Gaseous exhalations are washed out and absorbed from the atmosphere by the fall of rains. The earth's vegetation absorbs and consumes carbon dioxid, while the oxygen is set free. The oxygen of the air slowly burns up the numberless combustible vapors and contaminations which are thrown into it. By these means the earth's atmosphere is constantly maintained respirable and pure.

A CURRENT OF AIR UNDESIRABLE.

As has been shown, in natural incubation a spontaneous intermixture or diffusion of the gases takes place through the coverings of down and feathers, though they are sufficiently dense that any current in an outward and inward direction is prevented by frictional resistance. The latter aids in keeping in the warmth, and also in the rotting of the shell. That is, the carbonate of lime, of which the shell is composed, absorbs moisture. Carbonate of lime, however, is altogether insoluble in pure water, while water saturated with carbon dioxid dissolves 1-1500 part. Water, under ordinary circumstances, absorbs rather more than an equal volume of carbon dioxid. For its own temperature, the exhaled carbon dioxid is saturated with aqueous vapor; a part of both being condensed by the shell. Thus the ovum itself furnishes the means for the disintegration of the particles of the shell—the carbon dioxid rendering the carbonate of lime soluble in the water or moisture, which is always present. Although a free exposure of the egg to the atmosphere is indispensable to the development of the embryo, yet a current of air is exceedingly undesirable, as the rapid circulation of the atmosphere would be attended with the quick dissipation of the moisture and carbon dioxid.

THE RELATIVE HUMIDITY.

The rapid movement of the air around the eggs has yet other and equally deleterious effects, but they all, however, involve the same principle, *i. e.*: the drier the air, and the more it is agitated so as to bring fresh currents in contact with the moist surface, the more rapidly does evaporation take place. The effect of warmth is also to hasten evaporation, but a high degree of heat is not essential to it. At ordinary temperatures, wherever a moist surface is in contact with the air, vapor is formed. This

process is called spontaneous evaporation. Aqueous vapor is always present as a minor constituent of the atmosphere, and its amount, which is very variable both at different places on the earth's surface and in the same locality at different times, forms an important element of climate. The process of evaporation is constantly going on at the surface of the earth, but principally at the surface of the sea and other bodies of water.

The amount of vapor which can exist in the air is limited, and depends upon its temperature. It is therefore evident that if the air be saturated with moisture, no more can be vaporized; and that, in proportion as it approaches saturation, must the process of evaporation be retarded. Whereas, if the air contains but little vapor it can readily take up a large additional amount, and the process of evaporation must be proportionally hastened. On dry, cold days in winter, the evaporation is exceedingly rapid; whereas, if the air contains much

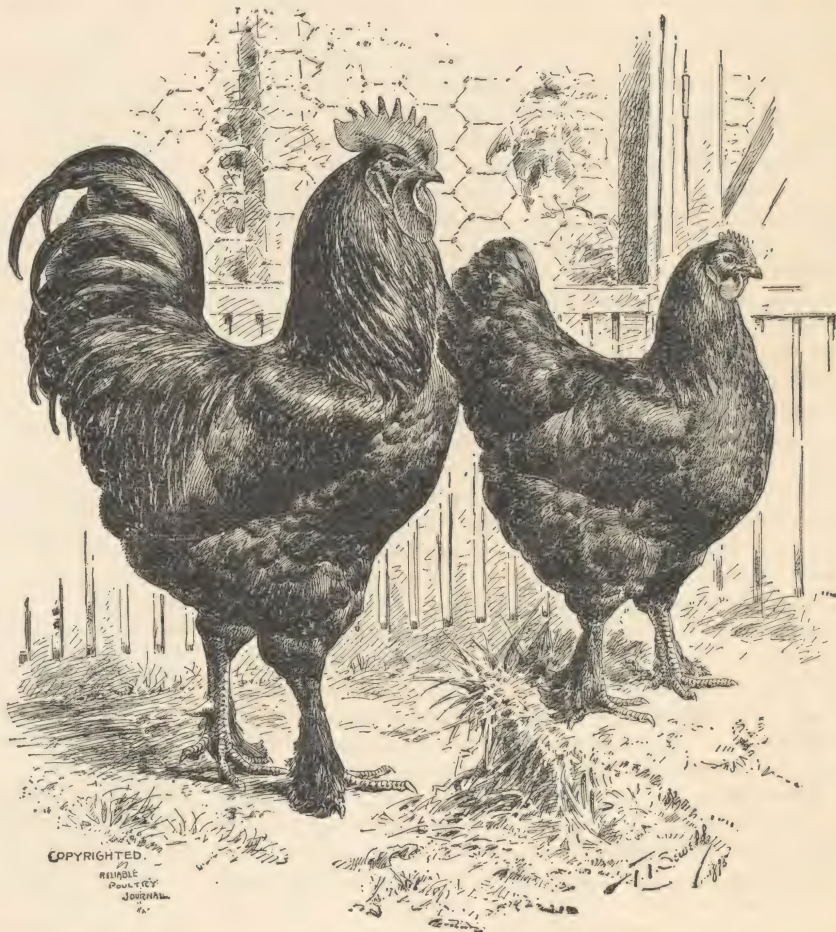
moisture, it proceeds very slowly, even though the air be warm. In other words, space has a capacity for vapor depending upon its temperature, so that if there is a given definite amount or weight of vapor in the air at a certain temperature, the relation which this vapor bears to the whole vapor-carrying capacity of the air at that temperature is very different from the relation which the same amount of vapor bears to the carrying capacity of the air at another temperature. This relation is commonly called the *relative humidity*. Air of a given temperature becomes saturated when there is a certain amount of vapor present, and it can be made to take up no more unless its temperature be raised. Any surplus vapor must be condensed. This vapor present in the atmosphere has, as a gas, a certain pressure, tension (or force, whichever term we care to use to express the same thing; and this tension may be as great or greater at the freezing point of water than during ordinary summer temperatures, as the atmospheric air is seldom completely saturated when its temperature is high.

All air found in a natural condition contains more or less of this gas which we call vapor, though it is seldom in a state of complete saturation. Even the dry air blowing over a heated desert contains a small amount and it is this amount which largely influences the rapidity of evaporation.

In natural incubation the eggs are surrounded by a mass of warm air, held entangled and separated from the outside atmosphere by a porous septum (partition) of down and feathers, which allows of a reciprocatory movement, or free interchange of the constituent gases and vapors of the inner and outer atmosphere. In other words, the air immediately in contact with the incubating body and eggs becomes warmed. In the gain of heat it expands, becomes lighter, or of a lesser specific gravity than the outside colder and denser air, and tends to flow outward into the latter, which replaces it. It does not, however, carry all its increased warmth with it. That is, in passing outwards, its molecules come in contact with those of the incoming colder air, and imparts to them a portion of its own greater warmth. This loss of heat by the outgoing, and gain by the incoming air, does not quite equalize their warmth within the walls of the septum, under ordinary conditions, but the incoming air gradually gains heat until it comes into direct contact with the heating body, when it has reached its maximum temperature, and then, flowing outwards, loses heat until its remaining warmth is finally dissipated in the surrounding atmosphere. Thus it is seen that the loss of heat is reduced to the minimum, notwithstanding the fact that the atmospheric air surrounding the eggs is being continually changed. The carbon dioxid and organic matter thrown off by the incubating body, and eggs also, as it gains in tension, gradually diffuses outward, being replaced by pure respirable air.

Again, as it has been shown that the porous septum offers no serious obstruction to the interchange of gases and vapors, it will be seen that the relative humidity or tension of the aqueous vapor in the two atmospheres must be essentially the same, regardless of the difference in temperatures. That is, the quantity of aqueous vapor held in suspension by the out-

side colder air is as great for its own temperature as the quantity held in suspension by the inner warmer air, and therefore the tension of the aqueous vapor is as great in one atmosphere as in the other. Either an increase or loss in one is immediately felt by the other, and a corresponding movement from the greater to the lesser immediately sets in, and tends to restore their equilibrium. Aqueous vapor will diffuse neither outwards nor inwards when it exists in the same proportion in both atmospheres, but dry carbon dioxid only will be exchanged for dry air, in the proportion of their equivalent diffusion volumes. The incubating body and eggs, however,



BLACK LANGSHANS.

STANDARD WEIGHTS { Cock, 10 pounds; Cockerel, 8 pounds.
Hen, 7 pounds; Pullet, 6 pounds.

Characteristics—Cost of raising to maturity, \$0.80. Annual cost of keeping, \$0.90. Average egg yield per year, 150. Average number of eggs to pound, 8. Hardy constitution. They are fair as foragers; can stand confinement; are fair as sitters and mothers. Grain and flavor of flesh good.

are continually throwing off watery vapor, which, increasing the tension of the vapor in the inner air above the tension of the vapor in the outer atmosphere, causes a slow diffusion outward, the movement tending to keep up the equilibrium.

Thus the relative humidity of the two atmospheres are always essentially the same whether the hen nests in a meadow on moist ground, and surrounded by a moist atmosphere, or in a hay-loft and surrounded by a dry air. And as she brings out equally as large a proportion of chicks in one place as the other, it is obvious that ordinary changes in the degree of humidity of the atmospheric air has no serious ill effect on the incubation of an egg.

UNDER ARTIFICIAL CONDITIONS.

We have seen that in natural incubation there is a reciprocatory movement, or free interchange of the constituent gases or vapors of the inner and outer atmosphere, through the intervening septum of down and feathers, which keeps the

inner air respirably pure, and tends to maintain the relative humidity of the two atmospheres. On the other hand, in artificial incubation the colder outer air, passing inwards en masse through one or more wide apertures in the solid wall of the egg chamber, creates a current sufficient to carry along with it whatever vapors with which it may be charged. Mingling with the inner warmer atmosphere, and coming in contact with the heating surfaces, it gains in temperature, which directly increases its capacity for taking up moisture. Reaching its maximum temperature, it eventually passes outward, still en masse, through the apertures, which again creates a current sufficient to carry along with it its vapors, with any additional gases or vapors it may have gained during its stay in the incubating chamber, and is dissipated in the surrounding atmosphere. This process is continuous, and is kept up as long as the apertures remain open, and the exchange between the two atmospheres is effected in the same manner, that is, by a continuous inward and outward current, whether there is but one or a number of apertures, the only difference being in degree or rapidity of the change, depending upon the area and location of the opening and the temperature of the surrounding atmosphere. In some machines the activity of exchange between the two atmospheres has been reduced to the lowest point, but with a corresponding loss in the purity of the air within the egg chamber.

The immediate effect of ventilating the chamber in which the eggs are placed by means of more or less wide openings in its walls, is to increase the capacity of the incoming air to take up moisture by raising its temperature, without providing to any appreciable extent for the absorption of moisture from the exterior atmosphere, and also the dispersion or carrying away of any moisture gained from the eggs placed within the chamber. Thus it is seen that the air around the eggs is in a comparatively dry state, there being a wide difference between its degree of humidity and its total capacity for moisture at its temperature. This state of the air stimulates vaporization, and causes an excessive evaporation of the watery portion of the egg. The egg originally contains about 74 per cent water, but nearly all of this large amount is as essential to the development of the embryo as the solids, for water is a very large constituent of all parts of the body. The bones contain 130 parts of it in 1000; the muscle, 750; the blood, 795; and it forms, in fact, nearly three-fourths of its entire weight. It is evident, therefore, that if the supply of water is diminished by excessive transudation (passage through the shell) and evaporation, the development of the embryo cannot go on.

The rest or movement of the air is of more importance than the difference in the tension or degree of humidity, as influencing the rate of evaporation; for it is found that evaporation is much slower in still air than in a current, with the same degree of humidity. The air immediately in contact with the moist surface becomes saturated with vapor, and a check is soon put to evaporation; if, however the air be quickly removed as fast as it becomes charged with vapor, and its place supplied with fresh, dry air the evaporation continues with undiminished rapidity. It is the protection from any current of air that largely prevents a rapid evaporation from the eggs in natural incubation, the diffusion of air and vapor around the eggs being a slow process of exchange in comparison with a current of air.

As incubation progresses there is a special respiratory organ developed, called the allantois, which eventually encloses the whole contents of the egg, and the exhalation of moisture then becomes a vital process. Yet the rest or movement of the air influences the amount of evaporation, even after it ceases to be merely a physical process; for we find that when a frog is placed in the draft of an open window it will lose triple, or even quadruple the amount exhaled by others placed at a

closed window in the same room. It is during the last stages of incubation, and after the exhalation of moisture becomes a vital process that the rapid evaporation from the surface of the egg, excited by a current of dry air, does the most harm, and which many times ends in the death of the embryo. The cause of the fatal effect of the rapid evaporation is to be found in the drying of the enclosing membranes of the egg; or, in other words, the membrane covering the ovum becomes too dry to take up enough oxygen to suffice for the development and vital activity of the embryo. While moist animal membranes allow the exchange of carbon dioxide and oxygen to be effected with perfect ease, offering no serious impediment to the passage of either gas, dry animal membranes are impermeable to gases.

Although the drying of the covering membranes often cuts short the development of the embryo, and the germs die at various stages of incubation, more generally the embryo suffers the most from this cause from the seventeenth day to exclusion, the greatest number dying about the eighteenth or nineteenth day. By the seventeenth day the albumen is about all absorbed, and the yolk is decreasing in size, and is less fluid. The chick is breathing by means of the allantois which entirely surrounds it and which is in close proximity to the shell and surrounding atmosphere. As the amniotic water (a fluid contained in the amnion which is the membranous sac that envelops the embryo) in which the embryo has been immersed is reabsorbed, the sac in which it was contained fills with air, and the chick drawing this air into the lungs, the pulmonary respiration is gradually established. As the pulmonary circulation increases in activity, the circulation of blood in the allantois gradually diminishes, and the allantoic fluid eventually disappears, so that by the end of the nineteenth day the only moisture of any consequence left within the egg is that contained in the substance of the yolk and embryonic structure. There is a pretty timing, however, in the loss of fluid by the allantois, for it does not normally entirely disappear until within a few hours of the rupture of its coverings by the chick, the membranes remaining moist for some time after, and do not become dry until the chick has been breathing the surrounding air direct for several hours. This is the critical period, for if evaporation be too rapid the allantoic fluid is too early dissipated, and the allantois then is dependent upon the embryo for its supply of moisture necessary to its function as a respiratory organ, and, should the rapid evaporation continue, its membranes very soon become too dry to take up enough oxygen to suffice for the needs of the organism, and death supervenes.

On the other hand, while unduly hastening the drying of the allantois by excessive evaporation is fatal to the life of the chick, an excess of moisture present in the surrounding atmosphere is equally as deleterious, although in the opposite direction; that is in the prolongation of its functional activity. In other words, by the time the embryo is sufficiently ripe to rupture its coverings the circulation of blood in the allantois is normally quite sluggish, and as soon as the chick gains access to the surrounding air the allantoic circulation ceases, and its membranes become dry. But, should the air be overcharged with moisture, the allantois and blood gain fluid by absorption, and the allantois remains functionally active. Continuing to absorb moisture, the chick eventually gains an excess of water sufficient to interfere with the vital functions.

FOUR PHYSICAL FORCES.

It will now be seen that, other conditions being equal, the degree of humidity ordinarily existing in the atmospheric air is sufficient for successful incubation, providing that the tension of the moisture in the two atmospheres remains the same, and that the rate of movement of the air surrounding the eggs exercises a more powerful influence on evaporation

than the usual variations of humidity. In the construction of a hatching chamber, therefore, there are four features of vital importance to be considered, viz., a non-conducting wall that will protect the eggs from outward changes of temperature; a provision for maintaining the atmospheric air within the chamber in a pure state; the maintenance of as great a tension of aqueous vapor in the inner as in the outer atmosphere for their respective temperatures, and the control of the movement of the air around the eggs.

As we have before stated, in natural incubation the purity of the air surrounding the eggs is maintained by exchanges with the outer atmosphere through the wall or septum that intervenes. This wall is composed of down and feathers, which allow of a spontaneous diffusion of gases or vapors through them, while they are sufficiently dense to hold any current in check by frictional resistance. It is therefore obvious that the natural provision for maintaining the purity of the air around the eggs also provides, through the same medium, for the retention of warmth, for an equilibrium between the relative humidity of the two atmospheres, and for the control of the movement of the inner air.

Appreciating these facts, it becomes easy to construct a machine that will control the physical forces of incubation, that is, the storage of warmth, and the purity, humidity, and movement of the air surrounding the eggs. Having these forces under control by natural processes, and a regulator of temperature that will automatically control it to within one degree, or less, we are in a position to hatch as strong and well-developed chicks as can be excluded by the hen incubating. The chick coming into life in a well-ripened condition has a good chance to make a live of it.

TAKING OFF A HATCH.

In cold weather it is seldom necessary to open the machine before the chicks are well dried off. In warm weather, with a large hatch coming off, it is well to open up when the hatch is about two-third over and remove as quickly as possible those of the dry ones that can be reached handily without removing the trays. Keeping two or three hundred chicks in a small space for a long time does them no good, still they should not be removed too soon, or it will injure the balance of the hatch. It is always well to err on the side of lateness rather than haste. In moving the chicks from the incubator to the brooder during cold weather, use a warmly lined basket or box, as the chicks are at this time very easily chilled. A chill means bowel trouble, and bowel trouble in very young chicks means short life.

THE BROODER AND ITS USE.

If we have properly selected, housed and fed our laying stock, and hatched the eggs in a machine correctly designed, we now have as fine a lot of chicks as one would wish to see—strong and active. It is the active chicks that make a live of it. If you have been so unfortunate as to have bought your eggs of general farm stock, and have a mixed lot of culls, you will do well when dividing the lot for different brooders, to put the strong and active in one brooder, and the weak together in another. Otherwise the latter will be crowded and trampled out of existence. Another way to prevent this is to put only fifty in a brooder.

It is safe to say that more failures in the broiler business have been caused by using market eggs—eggs purchased from farmers who kept a lot of inbred, all grain-fed culls—than from any other one cause. The chicks hatch weak, and what are left at six weeks old are fit for a show—all shapes, colors and sizes—and when marketed only bring third rate prices. So if you wish to secure chicks that are easily raised, and broilers that will command a premium over the top market quotations, look to your breeding stock before beginning to incubate.

The brooder temperature should be kept at ninety degrees for the first twenty-four hours, and then reduced one degree a day, regularly, for three weeks. If this is done the chicks will not feather so rapidly, and will be much stronger and more uniform than if kept at a high temperature, and the mortality will be less. At three weeks they will be ready to go into cold brooders, if the house is kept at seventy degrees, as it should be. This is the most successful plan for raising chickens. Use indoor brooders for the first three weeks, placing them in a building that can be kept at a temperature of seventy degrees. After the chicks are twenty-one days old they can be moved into rough board boxes or roomy hovers, the warmth of the brooder-house (seventy degrees) being ample for further needs.

The key to success in broiler raising is in never letting the young chicks get chilled, and in gradually hardening them off. The brooder-house should be well ventilated, and there should be no hover used in the small brooder. If the heat is kept where it should be, most any rational food will raise them. A food that is probably giving the best universal success is cracked wheat until they are three or four weeks of age. They will then be ready for forcing, and will stand concentrated foods, the composition of which can be regulated by the price of waste mill products and grain in each section.

CHAS. A. CYPHERS.



USE AND ABUSE OF INCUBATORS.

A Treatise on the Use and Abuse of Incubators, Together With Instructions as to the Best Method of Operating Incubators to Get the Best Results, Both in Hatching and in Raising the Chicks Afterwards.

BY J. L. CAMPBELL, WEST ELIZABETH, PENN.

Inventor of the Eureka and Combination Incubators, and an Operator of Over Thirty Years' Experience.

WHEN the editor of this book asked me a short time ago whether I considered the poultry business to be over-done, my reply was "No." While I believe this is true, yet there are times when more poultry is produced than the market will take at a paying price, but this is equally true of any other business, and the fault usually is not over-production but under-consumption. There are thousands of persons who are never able to buy poultry at all, and there is a time each year when the markets are glutted, but there never was nor ever will be so much poultry produced as to prevent first-class poultry from being sold at a paying price. There is abundant room, and always will be, for those who can produce the best, and who take the trouble to find a class of customers that will take the best regardless of price. There are plenty of this class, and plenty of room for the producer who is able and willing to supply them.

By far the larger part of the best poultry always has been and always will be produced from chicks which are hatched in March, April, May and June, not because it is impossible to produce first-class poultry at any other season of the year, but the fact remains, and is as unalterable as the everlasting hills, that nature has set a bound on the natural breeding season. This season varies with the latitude, of course, but, so far as my knowledge goes, it does not extend beyond four months in any latitude. While this is true the person who will assist nature to the full extent of all the knowledge which has been gained in the last two decades, can produce first-class poultry at any season, but for reasons too obvious to mention the amount so produced will always be limited and will always command the top of the market. The idea that a person can start at any season and produce all the poultry desired has long ago been exploded. The one reason above all others is dead chicks, and the next reason is that young chicks never grow in cold weather as they do in nature's own breeding season. The majority of those who have tried raising winter chicks have usually raised a lot of runts if they raised any, not, as before stated, because it is impossible, but because they have not fully supplied what nature does at the proper season, free of cost. It is a very common remark that any fool can raise chickens in the spring and summer months, but whoever thinks so is mistaken. However, given healthy

stock to start with, if the would-be poultry raiser will pay particular attention to only three things the old saying will, in a good measure, prove true—keep the chicks dry and warm, feed properly, and keep them clear of lice. Any person who will do these things can raise chicks in the spring and summer, and those who do not can not raise them at any time. My object now will be to try to give all the information I can to those who have not had experience, and to assist those who have had to the full extent of my power, for, although I have been raising chickens all my life, I learn something new every year.

The very first essential to success in the use of any incubator is healthy and vigorous stock. The cock is half the yard, and hens and cock must be equally vigorous and kept in perfect health. I learned to my cost, that although my stock was apparently in good health yet I could not hatch a satisfactory percentage of the eggs, and I experimented until I found why, and now I propose to tell you just what I learned myself.

As above stated, the first essential is healthy and vigorous stock. Now the vigor of the cock is often impaired in a way that few think of. A cock to produce strong vigorous chicks should not be allowed to get fat or to run down in weight. Often a cock that is very attentive to the hens does not eat enough to keep him in good condition. He fools around until the hens have gobbled all the food, so that you must either overfeed the hens or underfeed the cock.

A real good breeding cock never eats enough to make him too fat, it is always the other way. During the hatching season the cocks should be examined frequently, and when found to be getting too light my plan is to coop them every morning and feed all they will eat, and if necessary the same at night. Very often the incubator has to bear blame which should be all placed on the cock. No one need expect good hatching eggs unless the cocks are in perfect health, have bright red combs, and are reasonably up in weight without being fat enough to be clumsy. If a cock eats enough to be fat the best possible thing to do is to cut off his head and eat him. I would rather hatch eggs from one that was too light in weight than too heavy.

Taking it for granted that our male birds are all right we will proceed with the proper condition of the hens. It is generally supposed that if the hens are in good health and condi-



J. L. CAMPBELL.

tion and laying eggs, that the eggs should always hatch well, but such is not the case. Hens which have been forced to the full limit and kept up to high water mark in the production of eggs are seldom in condition to lay eggs that will hatch a large percentage of healthy, vigorous chicks. Let two hens start even, one to lay five eggs and the other seven eggs a week. For the first two or three weeks perhaps nearly every egg from both will hatch. After that it will be found that the hen which averages five eggs per week will produce more healthy chicks than the hen which lays every day, although as a matter of fact I have seen but very few hens which could or did lay every day for more than ten days at a time. If your hens are in perfect health the way to get hatchable eggs from them is not to try to make them lay every egg possible by stimulating food and by feeding too much, but to give them good wholesome food and feed so that they are always ready to eat every bit you give them. One of the hardest kickers against overfeeding I know of is P. H. Jacobs of the *Poultry Keeper*, yet even Mr. Jacobs feeds too much for me. I believe he advocates giving all the grain they will eat at night. I have tried that and find that when I do it is not long until the fowls do not want an early breakfast. My plan is to give them whole grain at night, but not all they will eat. I always stop short of that, but do give them plenty at all times to keep them in good condition. A hungry hen is usually a healthy hen, and only such hens can produce eggs which will hatch strong, vigorous chicks.

There are plenty of persons who will doctor their hens all winter for roup, cure (?) them and then expect to hatch good, healthy chicks in the spring. They will usually be disappointed as the number of healthy chicks produced from such hens will always be very limited. I have hatched from hens which had been cured of the roup, and the chicks would have sore eyes and swelled heads as soon as dry, and I have bought and hatched eggs from others whose hens I knew had the roup, with precisely the same results. A hen which is or has been cured of the roup in mid-winter is liable to die from it in mid-summer. My opinion is, that no fowl is ever perfectly cured of roup or should ever be used as a breeder, and I believe that roup is spread more through selling eggs from such stock than by any and all other causes combined. The above conclusions have all been reached through experience, some of it pretty costly, and I know that the very first lesson any person needs to learn if such person desires to become an expert operator of incubators, is that the very first requisite is perfectly healthy stock, properly handled and fed. If more attention were paid to these points there would be fewer complaints about eggs not hatching.

EGGS FOR HATCHING.

The next question that comes up is the care of the eggs until set. I often have to answer the question, how soon after the eggs are laid is the best time to place them in the incubator? The answer is, the same day, but eggs of hens or turkeys will hatch well, if properly kept, two weeks after being laid. My experience with duck and goose eggs is that they will not keep as long as either hen or turkey eggs. Sixty degrees is what I consider the best temperature for preserving eggs for hatching. Lower than that is better than higher. Eggs kept in a very warm place soon start the germs enough to spoil them and make nothing but addled eggs when placed in the incubator. Sixty degrees will neither start nor chill the germs, and keeps them good longer than any other temperature I have tried, and I have experimented all the way from twenty-eight to ninety-six. Eggs that had been kept for a week at twenty-eight would start to hatch, but I never could get any of them to live longer than ten days, producing only addled eggs; kept above ninety for any length of time the result was the same, mostly addled eggs. At sixty degrees eggs from good

healthy hens will keep and hatch fairly well at three weeks old, but I never care for any that are more than ten days old. I once placed in an incubator an egg which had been laid seventy-seven days before. This egg had a small hole punched through the shell in the large end without penetrating the membranes, however, and a bit of paper was stuck over the hole with mucilage. The egg hatched but the chick died afterwards. I do not think that more than one egg in a thousand would stand such treatment as that and hatch.

The best way to keep eggs is to either turn them or stand on the small end. Although I at one time advocated standing the large end down, I found that I was mistaken and changed my mind.

A very important point is that very large and very small eggs placed in the same incubator will seldom, if ever, hatch as well as if incubated separately, the conditions which are exactly right for small eggs not being right for large ones. A small egg has much more shell surface in proportion to contents than a large one, so that to run the machine to suit the small ones will make it too damp for the large ones, and if made just right for the large eggs the small ones will dry out too much so that many will fail to hatch for that one reason alone. When large and small eggs are incubated at the same time the best results will always be obtained by striking an average, a little too dry for the small and a little too moist for the large ones.

The experienced operator who has paid particular attention to the size, shape and structure of the shells can select with a good sunlight egg-tester, most of the eggs that will fail to hatch through any fault in the shells, or defects in the contents, such as blood clots, mildew, cracked or imperfect shells. Hundreds and thousands of eggs are destroyed by crushing caused by the weight of the cocks just when the shell is formed thick enough to crack. It springs back to place again and when the shell is complete a casual observer will overlook most of them, but as a matter of fact so few of them will hatch that it is only a waste of eggs to use them. Very often it can not be positively stated just which ones will not hatch. The only reason I can give for some eggs not hatching is that the minute cracks in the shell by some means cause a rupture of the delicate blood vessels and the embryo bleeds to death and we have an addled egg. I have looked at such eggs and seen a fine, healthy looking germ; the next day the same egg would show that the blood had all run out of most of the veins and the chick was dead, very clearly showing that the embryo had bled to death.

To get the best possible results select eggs as near a size as possible, with smooth evenly shaped shells. Reject all warty, ill-shaped, over-sized and extra small ones. Examine them with a good tester and select out all which show red or black specks, those in which the yolk remains stationary and all those in which the air in the air cell will travel around loose. Not many of the latter are found unless the eggs have been badly shaken, but I have had basketfuls of them in that condition. Such eggs never hatch.

Leghorn eggs from good healthy stock or Leghorn cocks crossed on almost any kind of hens will usually produce as good hatching eggs as can be had. The Asiatics as a rule do not average as large percentages as the Mediterranean and American breeds. It has always been my experience and also the general verdict of the greater part of all the poultrymen with whom I have talked on the subject that nothing hatches like the Leghorns, or Leghorn crosses, and while I have no admiration at all from a fanciers' standpoint for a yard of fowls so mixed and crossed that you could not tell what the original stock had been, yet I must confess that out of tens of thousands of eggs which I have bought for hatching purposes solely, I never got any eggs which hatched better than

eggs from just that class of stock. One man in particular from whom I purchased a great many eggs made a regular practice of buying some pure bred cocks each season, and turning all loose together. Occasionally he would vary the program by buying a lot of pure bred eggs and turning out all the pullets he could get; but he never made any pretence of having anything but mixed stock, and I never saw eggs hatch better nor saw healthier chicks. I raised several lots of them myself, and the invariable verdict of those who bought the chicks was that they made first-class hens to lay, and while I am no advocate of cross-bred stock and do not claim that pure-bred stock can not be as vigorous as the cross-bred, yet I do claim and know that very much of it is too pure-bred. The average person who merely wishes to get out and raise the largest possible percentage of chicks with incubators and

so much difference in the number of eggs which the different breeds will lay in a year as is usually supposed to be the case.

For eggs alone, leaving out any other consideration, no fowl can exceed the Leghorn, either white, brown or black, rose or single comb. With good cocks the eggs will hatch against those of any other breed in the world. The Buffs I know nothing at all about.

For an all-round purpose fowl the Plymouth Rock, barred or white, is the only kind I have used. Both are first-class, and will satisfy any reasonable person.

The Light Brahma is one of the grandest breeds on earth, but they are perfectly useless to any person who cannot or will not give them the proper attention. Make them work all day, feed them in the evening enough to keep them in good, healthy condition, and they will lay enough eggs to satisfy almost any person. I love them and always will. Cochins are the best winter layers I ever kept. The hens crossed with a Brown Leghorn or Houdan cock (large size of either) produce a large, solid and rapidly growing chick, first-class for either broilers or market purposes. The Partridge Cochin was my favorite while I kept them.

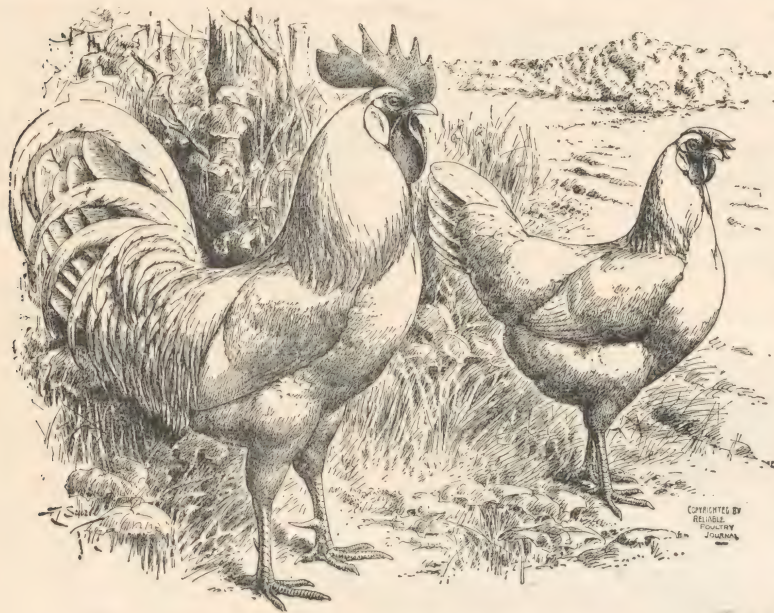
The Black Langshans are excellent birds, large and very fine as a table fowl. My only objection to them is that they are very slow to mature, slower than either the Brahma or Cochin with me, but they make almost ideal mothers and the best of fall layers.

The Black Spanish is a noble breed. The eggs are very large and there are plenty of them, but they are rather hard to hatch and the chicks are delicate. These hens crossed with a Hamburg cock made the best layers, without any exception, which I ever owned. The color of the skin is against them as a market fowl, but it is all prejudice, as the flesh is very fine and of excellent flavor.

The Houdan is unexcelled as a table fowl. They are non-sitters and are great layers of large white eggs, which are rather too large to hatch well, partly on account of thin shells. Cross the cocks on any good sized hens and you will be delighted with the chicks as a table fowl. Such cross-bred chicks with me have dressed five and a half pounds at five months old. Black Minorcas are considered by many to be equal to the Leghorns as layers, and judged by the weight of the eggs I believe they are, but mine were always behind the Leghorns in starting to lay. A person who understands just what to expect from them will not be disappointed with them, as they are great layers when they do start. I should hatch them as early as possible.

The above breeds I consider to be among the best of all those I know anything about. Any of them are good enough for any person, and the breed you like best will be most apt to be the one with which you will succeed best. In the above I have merely given you an idea of my own experience with the breeds mentioned; others may have had a different result with them than I. At the present time I have nothing but Leghorns, Brahams and Rocks, and I believe that in these three breeds can be found a combination of about all the good qualities of all the other breeds. Among the birds of those who keep pure-bred stock will be found as many of these three breeds as of all the others combined. Of course I include all the varieties of these three breeds.

We shall now proceed with the main object of this article, the incubator and its uses. The different subjects will be treated under separate heads as far as possible, so that readers will be able to more readily find just what is wanted. The first thing therefore will be the incubator itself. Being a manufacturer of incubators I suppose you will naturally expect me to recommend my own make, but I do not propose to do any-



SINGLE COMB WHITE LEGHORNS.

POPULAR WEIGHTS { Cock, 5 pounds. } No Standard Weights.
 { Hen, 4 pounds. }

Characteristics—Cost of raising to maturity, \$0.40. Annual cost of keeping, \$0.75. Average egg yield per year, 190. Average number of eggs to pound, 10. Hardy constitution. They are fine as foragers; can stand confinement; are non-sitters and poor as mothers. Grain and flavor of flesh poor.

brooders will succeed as well if not better with a lot of cross-bred fowls than with any pure breed he could use. For myself I go in for pure-bred stock every time, because I like best to see and own such fowls, and I can make the most money out of them; but facts are facts all the same, and as the sole object of this treatise is to enable incubator users to succeed in making poultry and especially market poultry pay, I intend to give nothing but the best facts along that line that I can. The only point I wish to make and emphasize in the foregoing is that the very first thing the incubator operator needs to do is to get good eggs from good healthy stock. They also require good strong constitutions as well as good health. The surest way to have such stock is to raise and own it, but if eggs have to be bought go to see the stock if possible, if not, then buy only from some one you have good reason to know will treat you fairly even if you do pay a little more in the first place. I should always prefer to send five dollars to the man whom I know will send me exactly what he says he will than half that amount to the man who may or may not send me what I have a right to expect.

THE BREEDS MR. CAMPBELL RECOMMENDS.

To save myself and others trouble in the future I will make a few recommendations as to breeds for various purposes, but will say at the outset that just as much will always depend on the handling as on the breed, and that there is not

thing of the kind. That is not the object of this article. I will, however, point out what is required in the make-up of a good incubator, as there are certain things which are absolutely necessary and which must be possessed by any incubator to enable the incubation of eggs to be done in a satisfactory manner. Any incubator which possesses these requisites will do all that the incubator can do, the balance must devolve on the operator.

THE INCUBATOR.

A good incubator must always possess the following points of merit (more than this is not absolutely required; if it has less it is not a good incubator:)

First, it must automatically maintain a uniform temperature, which must not vary more than two degrees either up or down from that degree at which the operator wishes to hold the heat.

Second, it must maintain a uniform heat with variation not to exceed two degrees in any part of the egg chamber.

Third, it must be so made that a proper supply of fresh air is being constantly admitted to the egg chamber without any direct draft on the eggs, and the ventilators must be so made that the openings can be very small in cold and very large in hot weather.

Fourth, a good incubator must have a safety valve which will open only to prevent the overheating of the eggs because on a hot day eggs can overheat without any other heat than the animal heat produced by the eggs.

Fifth, provision must be made so that any desired amount of moisture can be had, from none at all to saturation if needed.

The above five points of merit are all that are absolutely required in an incubator to enable a careful operator to make a good hatch every time that the machine is filled with good eggs, but it will be quite an advantage should it also possess the following additional points of merit:

First, it should be easy to heat so as to be economical in the use of oil or gas.

Second, it should have a nursery for the chicks which is not quite so warm as the egg trays, either arranged so the chicks drop in as hatched, or where they can be placed from time to time as they hatch out.

Third, a method of turning the eggs without having to remove the trays from the egg chamber.

Fourth, a method of turning the eggs automatically at regular intervals.

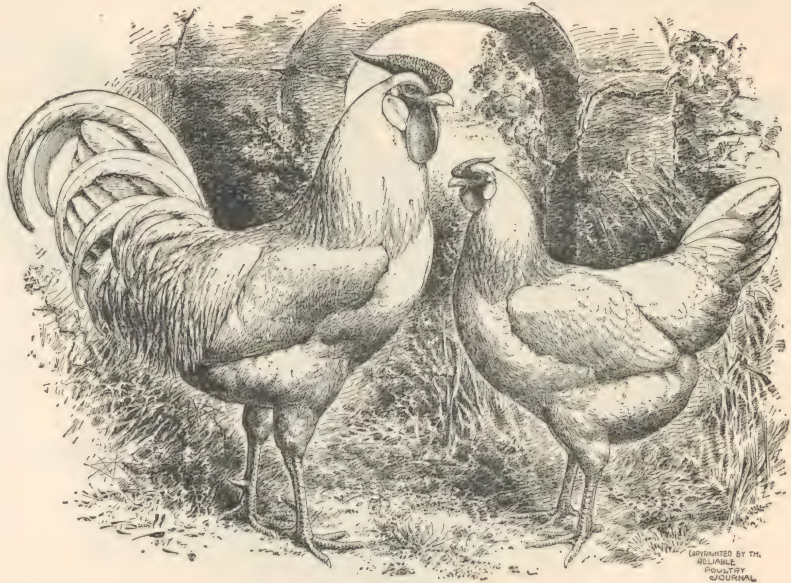
The above will enable the beginner to select a good incubator. Should it possess the first five points of merit that is all which need be insisted on, less than that should never be accepted, as anything below that scale of merit will make the machine dear as a gift if it is to be operated.

WHERE TO OPERATE AN INCUBATOR.

This is a point of great importance, but so much depends on the style of incubator that only general advice can be given. Any place where the temperature is very uniform and not damp will be suitable for any style of incubator, but if it must be kept where the temperature is sure to vary greatly then it is absolutely necessary to select a machine which can accommodate itself quickly to sudden changes either way. Such an incubator can be successfully run anywhere that a person could live in comfort. A good, dry, well ventilated cellar is always a good place, but many cellars are too damp except in dry weather, then they answer very well, but on the whole I prefer to be above ground.

TEMPERATURE.

This is the one thing of greatest importance. It is possible to have the heat just right and still fail to get a satisfactory hatch, yet if the heat is right a total failure will never result regardless of other circumstances. Taking it for granted that the eggs are good and hatchable, the great majority of all failures are caused by improper temperature. Generally the operator thinks the heat was exactly right all the time, but he is usually mistaken. Mistakes are made in many ways, but the most common one of all is in taking the temperature from dead eggs and thus the live ones are overheated. The actual difference between the live and the dead eggs in the same tray may be anywhere from two to ten degrees, so that it is possible for an operator who has the thermometer on dead eggs at 105 to have the live ones up to 115, in which case all



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POPULAR WEIGHTS { Cock, 5 pounds. } No Standard Weights.
 { Hen, 4 pounds. }

Characteristics—Cost of raising to maturity, \$0.40. Annual cost of keeping, \$0.75. Average egg yield per year, 190. Average number of eggs to pound, 10. Hardy constitution. They are fine as foragers; can stand confinement—are non-sitters and poor as mothers. Grain and flavor of flesh poor.

will very soon be dead. Usually the difference, however, will not exceed five degrees, but that is quite enough to kill most of the chicks should the operator be keeping the heat up to the full limit of safety. The proper temperature is from 101 to 105, 103 is the best for chickens, a half degree less is rather better for ducks and turkeys. I have hatched every turkey egg often at 102, and also at 103. I never could afford to use turkey eggs to experiment with because I never could get more than I wanted; and I never had any to die from overheating so I could not say whether or not turkeys will stand as high a heat as chicks, but I do know that chicks will stand a heat (and hatch out as lively as crickets) which will kill every duckling in the incubator, not that it is any benefit to the chicks but simply because the difference in the constitution of the two fowls enables them to stand it.

Many mistakes are made through incorrect thermometers. A thermometer may be exactly correct when you get it, and a year afterwards it may be two degrees wrong. I have frequently had them change that much in a year, but usually not over one degree. Thermometers should be tested each season until they are at least three years old. The construction of the glass has much to do with the amount of shrinkage, a very large bulb will shrink more than a small one usually, but not always, because if the small bulb has a correspondingly small thread there will be no difference. Then again two thermom-

eters may be as exactly alike as it is possible to make them, and one will rise twice as much as the other, so that each one must be tested and judged by itself without reference to anything except a correct standard.

Many operators place the thermometer close to the door so as to see it readily. This should never be done as it is seldom that the doors are kept shut tightly enough to make them air-tight, and a very slight amount of air falling directly on the bulb will lower it several degrees, more especially if the outer door is glass.

Again, an operator may select live eggs on which to place the thermometer and the heat will run all right for several days when it may be found to be several degrees too low. The operator concludes that the incubator is at fault and proceeds to bring up the heat again without first looking at the eggs to

eggs will be 105. There is no better indication than to see the eggs run away ahead of the tank. It shows plenty of vitality but also requires great care that all is not spoiled by overheating. The construction of the machine must always be taken account of in this method, because a machine which has no bottom heat can never be run by exactly the same methods as one that has. A machine with a top tank only will require the water to be from 120 to 110 usually clear through the hatch, so that each machine must be operated to suit the way it is built. The average heat of the eggs should be the same in any kind of incubator of course, but with a machine which has both top and bottom heat the eggs are as warm at 103 as they are at 105 in one that has all top and no bottom heat. One style will hatch just as well as the other, provided that each one is properly handled. All that is necessary is to have

the proper amount of heat. It can come from top, bottom, side, back or front, any place at all, so you have just enough and not too much, all theories and statements to the contrary notwithstanding. I have used every imaginable plan to heat the eggs, all bottom and all top and every other way, and I care not where it comes from just so you have the right amount and it is uniform, and it goes without saying that the easiest way to have it uniform is to have the entire top of the egg chamber a perfectly uniform heat, which fact makes theorists and others suppose that top heat, because the old hen sits on top, is the only kind of heat which will hatch eggs.

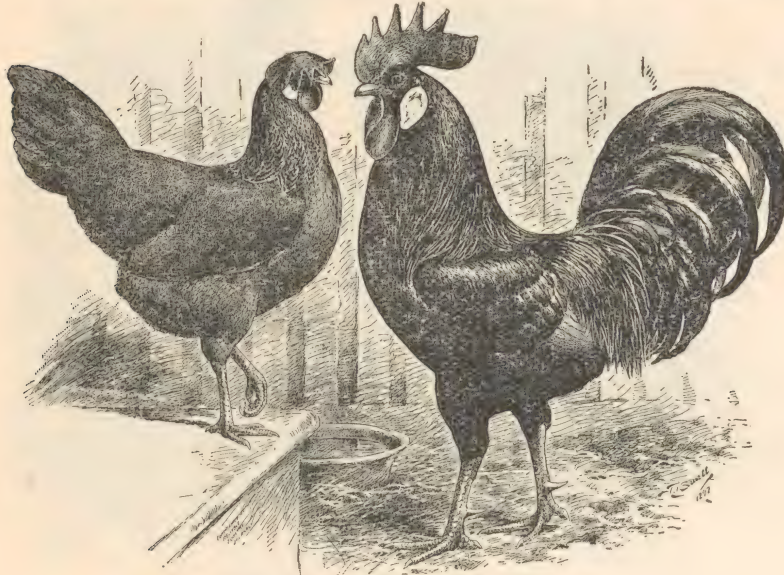
DIFFERENCE BETWEEN HOT AND COLD WEATHER HEAT.

There is one very curious point about temperature which has caused me a great amount of study, and even yet I am not absolutely sure that I have reached the proper solution of this problem. It would naturally be supposed that it was easier to overheat eggs on a hot day than on a cold one, and so it is, but the rather curious fact remains that sometimes on a hot day chicks will stand a heat which would kill every chick on a cold day and it appears to do them no harm whatever. I have experimented a good bit along that line, and I am not satisfied that I know all I want to know

about it yet. A case in point will illustrate what I mean. The lamp on one of my incubators was accidentally left in such shape that the regulator could not shut it off. The day was very hot, and only a very small flame was burning at best, but the heat went to one hundred and twelve, and must have been that high for at least two hours, quite long enough to heat the chicks to that point. This was the 18th day of incubation, and I decided that the chicks were done for, as they appeared to be dead on examination. The temperature of the room was 96 at the time, so I opened the incubator and left them for several hours, and 133 chicks hatched out of 147 eggs, and those chicks are nearly all alive and doing well at nearly two months old. I have purposely heated incubators to 112 on a cold day with the result of killing nearly every chick inside of one hour. I think the difference lies in the fact that on a cold day the extra heat is all incubator heat, while on a hot day a good part of it is animal heat, or in other words, the same amount of incubator heat applied on the hot day that is applied on the cold day would run it up to perhaps 130, and the chicks would all be dead before they became that hot. The solution I think is somewhat like the reason that a person who is acclimated can stand a heat which would kill a person who it not.

WHEN HIGH TEMPERATURE IS MOST INJURIOUS.

The germs are injured easiest at the start. They will stand a heat after the tenth day without injury which would



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 { Hen, 4 pounds. }

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see if they are alive, and the result is the incubator is made too hot because the chicks in those eggs had died. Every operator should always remember that it is possible for any chick in any egg to die at any time during the hatch, and that any time the heat is found to have dropped suddenly without apparent reason, the first thing to be done is to examine the eggs on which the thermometers are placed in order to be sure whether they are alive or not.

Then again eggs which are alive and touching each other in the incubator will very often vary as much as three degrees. The same egg will vary from one to three degrees without any change at all in the heat of the incubator. This is one of the anomalies or curiosities of incubation for which it is difficult to account, but it is safe to say that it causes the loss of a great many chicks in hatching with incubators. A good safeguard against troubles of this sort is always to have several thermometers in at the same time, which very much diminishes the chance of error. Also if it is a hot water machine the operator should be well posted on the heat of the water in the tank. See what is required when the eggs are first put in to bring them to 103, then watch carefully all through the hatch, and find out what it is all through. By this method you become well acquainted with your incubator, and it will be found that in some machines the tank must be about 108 to 110 to bring the fresh eggs to 103 but by the 16th day the tank may be down to 98 or even as low as 95 in quite warm weather, while the

kill every one on the first day. They might not die immediately, but they would die before hatching time, therefore it is of the utmost importance to be sure that eggs are never overheated at the start. It is far better to take twenty-four or even forty-eight hours to get them up to the proper heat than to make the incubator too hot at first in order to hurry matters. A very large percentage of failures results from this cause. Every day that eggs are incubated decreases the danger in one way and increases it in another. The younger the germs the less heat above what is proper will they stand, and the more they progress the less incubator heat is required to overheat them, so that the one in a measure regulates the other.

PROPER TEMPERATURE FOR STARTING.

With a top heat machine, either hot air or hot water, place all the eggs on one level, large ends slightly the highest, the worst possible position for an egg is on end. Lay the thermometer so that the bulb rests on two eggs and is nearly level with the top of the eggs, never under any circumstances below the center of the eggs. Then bring heat to 103 if the weather is cold, and to 102 if it is warm. In either case then the average heat of the eggs will be about the same. Keep pretty close to 103 all through the hatch. Remember also that 104 or 105 is all right for the top heat machine, but that you are then at the extreme limit of safety, whatever you get above is too much; and that although it is possible to hatch chicks at a temperature which may be constantly varying from 90 to 110, such chicks are never healthy and vigorous and very seldom pay for the raising. The immediate effect of overheating is that it destroys the red corpuscles of the blood. The higher the heat the whiter the blood becomes and this is the reason that overheating is so injurious, because although the chick is not killed the vitality of the blood is so destroyed that the chicks recover very slowly if at all.

HEAT OF INCUBATOR.

Another point in regard to temperature which is of the utmost importance for all operators to learn, is that the heat of the incubator and the eggs are two entirely separate and distinct things, that is of course after the embryos have developed enough to produce animal heat. Times without number I have had to reply to the question about as follows: "Why is it that when I run my incubator empty I have no trouble at all in keeping the heat exactly where I wish, but after the eggs have been in about ten days I can do nothing with it. The heat jumps up and down without any reason at all that I can see?" The answer is simply that the first is incubator heat and the other is heat of the eggs.

Now as we stated before, the proper method of taking temperature is from the live eggs, yet it is possible also to make good hatches and never let a thermometer touch an egg. To run by this method place the bulb of thermometer on a support of some kind so that it is not less than three inches from an egg, and just at the level of the top of the egg. Then for the first ten days keep the heat exactly at 103 or as near as your incubator will let you, then reduce to 102 for balance of hatch. I have hatched thousands of chicks by this method, and while it is not the best way, or not the way I usually follow, it is less trouble than any other. But to be successful your regulator must regulate in fact as well as name.

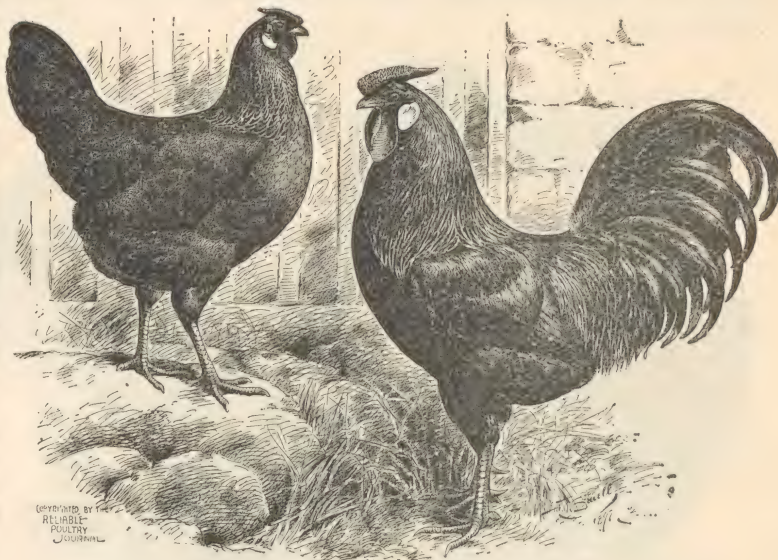
TESTING THE EGGS.

This is a point which is not usually considered as important as it really is. Testing the eggs is so intimately connected with the proper temperature that it comes only second to the temperature itself. Granted that it is possible to make a good hatch without testing the eggs, yet such hatches are usually

accidental. Where nearly all the eggs contain live germs it is not very material, but when a large part are infertile it is very important to get them out. A live egg surrounded by several dead ones is in no position to get the proper heat, and it has to be a very vigorous germ if it hatches at all. Infertile and addled eggs should always be tested out on account of the temperature if for no other reason.

TURNING EGGS.

Next to the moisture question there is no point about hatching eggs which has been more discussed, understood and misunderstood than the turning of the eggs. The operator who makes up his mind from one or two hatches that turning is important or unimportant as the case may be will be apt to guess wide of the mark. Some eggs will hatch with very little turning, some have even claimed to hatch them without



ROSE COMB BROWN LEGHORNS.

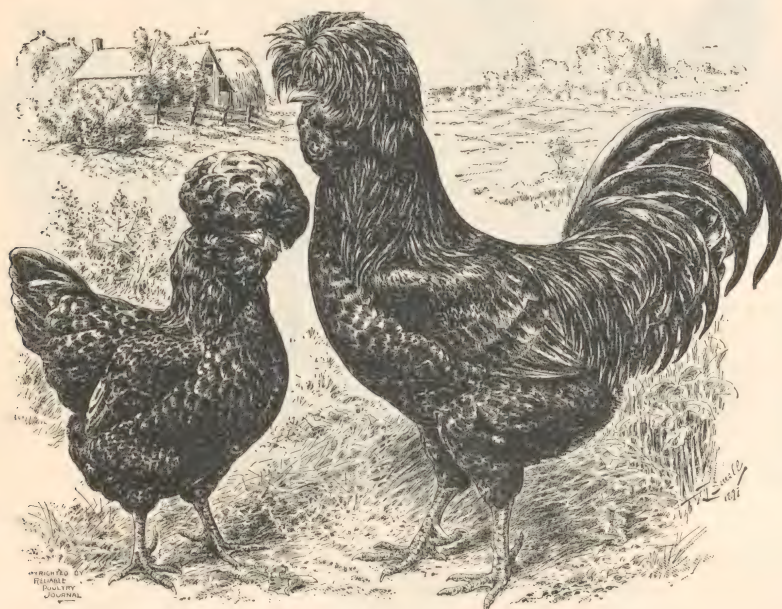
POPULAR WEIGHTS { Cock, 5 pounds. } No Standard Weights.
 { Hen, 4 po unds. }

Characteristics—Cost of raising to maturity, \$0.40. Annual cost of keeping, \$0.75. Average egg yield per year, 190. Average number of eggs to pound, 10. Hardy constitution. They are fine as foragers; can stand confinement; are non-sitters and poor as mothers. Grain and flavor of flesh poor.

any turning, something I could never succeed in doing, although I have tried a great many times. Moving the eggs has the same effect as turning and an egg that is moved a few times without turning at all will often hatch. Turning is the best, however, and if eggs are turned a few times between the fifth and the twelfth days they will hatch if not moved the balance of the time. It is always uncertain, however, and good hatches of good chicks are never obtained without turning the eggs. It is not absolutely necessary to turn eggs before the fifth day, but it is better to begin on the second day and turn at least once each day until the fifth day. Then until the twelfth day they should be turned carefully and systematically at least twice in twenty-four hours, three or four times is better if it can be done without cooling the eggs off too much, if not then less turning is better. If turned well up to the twelfth day they will hatch if not turned any more, but better hatches and better chicks are obtained if the turning is kept up until the chicks begin to pip the shells.

Any person who will study the structure of the egg while it is hatching can readily discover why turning is very important, but there are two reasons above all others, which are these—first, to prevent settling of the contents, and merely moving the eggs will in a measure prevent this, and, second, to prevent the blood vessels growing fast to the shell while too short, thus confining the chicks close up against the shell. Let eggs lie perfectly still for ten days, then break and exam-

ine, and it will be found that the chick is confined to a small circle which in many cases can be covered with a silver quarter, with the blood-vessels very short between the chick and the shell. No amount of turning after that time can remedy this, in fact the chick is so confined that its eyes will stick right up against the shell. I have tried this with hundreds of eggs at a time and know whereof I speak. Proper turning at the proper time causes these blood-vessels to lengthen out so that the chick is free to move about and turn over and has room to grow properly. A very large percentage of the eggs when left to lie still until the twelfth day will have blood-vessels on the upper side only, and never get them on the other side even if turned over. Such chicks would not be properly incubated even if they did hatch, which few of them will do as a general thing.



HOUDANS

STANDARD WEIGHTS { Cock, 7 pounds; Cockerel, 6 pounds.
Hen, 6 pounds; Pullet, 5 pounds.

Characteristics—Cost of raising to maturity, \$0.70. Annual cost of keeping, \$0.90. Average egg yield per year, 170. Average number of eggs to pound, 9. Average constitution. They are good as foragers; can stand confinement; are fair as sitters and poor as mothers. Grain and flavor of flesh good.

VENTILATION AND MOISTURE.

These two points are so intimately connected that it is not possible to properly treat them under separate heads so we shall place them together where they belong. Next to temperature they are the most important things which every operator should try to fully comprehend. Shakespeare makes one of his characters say, "I would rather show twenty people than be one of the twenty to do my own showing." I want to transpose that a little and say that I would rather make twenty hatches than try to show twenty people how I make one, and mainly for the reason that each of the twenty will understand me differently. But we all know that it is much easier to do a thing which you understand perfectly than to teach some other person to do it, so if I fail to make myself plain on these two very important points of artificial incubation, it will not be for want of trying.

It is quite common now to read that moisture in incubators is entirely useless, in fact injurious, but the person who thinks that an incubator can be made which will always produce good hatches of good chicks regardless of conditions, without using any moisture, is just as far wrong as the man who thinks that it is impossible to make a good hatch without moisture. The weather, climate, location of incubator, humidity of temperature of hatching room, eggs and construction of incubator all have a bearing on this subject, and only for the fact that the

whole thing can be reduced to a plain simple rule, not one of us would ever know whether we were right or wrong. The idea that a certain number of pans of water must be put in on certain days, and that a good hygrometer is a good guide, or that a moisture gauge will always tell the story, is all humbug. There is just one correct and infallible guide, and that is, the eggs themselves. The old plan of floating the eggs in warm water always was and always will be reliable, but the very same end can be attained simply by looking at the eggs in a good egg tester. The size of the air cell is the infallible guide for moisture.

As to the question of moisture or no moisture, that is a question which must be decided strictly on its merits. There are times to be sure when the humidity of the air is too great for successful hatching without using any moisture at all; also there are times when it is just right and no moisture at all is needed, but it will not do to decide from the above that none is ever needed. The air is sometimes too dry to get out a fair hatch without using moisture, and the operator who at such a time uses a great deal, and then after a successful hatch decides that he knows just what to do at all times is liable to make a mistake. The fact is, that the whole problem is simply a question of a proper balance between heat, moisture and ventilation. Each one influences the others, and to be always successful we must take all three points into consideration at all times.

Moisture has more uses than one in artificial incubation. There was a time when I supposed that its only use was to prevent the eggs drying out too much, but I discovered later on that it has at least two other important functions to perform. What I consider the most important of the three is the diffusive power of watery vapor to equalize and soften the heat. We must remember that such a thing as perfectly dry air does not naturally exist. I very much doubt whether a human being could live an hour in perfectly dry air. It is always moist to a greater or lesser extent. An incubator filled with fresh eggs will produce considerable moisture from the evaporation of the eggs. The higher the heat the faster the eggs evaporate, and while it is possible to

make good hatches and not use any other moisture than that obtained from the eggs and the air, to do so the heat must be kept down well within the limits at all times, and the ventilation must be as low as will keep the air reasonably pure. During the first half of the hatch the eggs use but little oxygen, and by keeping the ventilation down to the lowest limit that will dry out proper sized air cells, and keeping the heat down to 103, it will be found that under all ordinary conditions of the atmosphere, fair hatches can be obtained without the use of moisture. But the question arises, is that the best method of operating? And the answer is: No, it is not.

Suppose now we start our incubator at 103 and adjust the ventilation so that we can get the sized air cells we wish without using any moisture at all. If now we should increase the ventilation and still use no moisture it would be found that our air cells would soon be too large. If at the same time we should increase the heat one or two degrees this would make an additional very rapid increase in the size of the cells. Heat without circulation of air will not dry anything, circulation without heat will dry rapidly, but with circulation and heat combined we get the maximum rapidity of drying out. Now let us take our eggs at the point when we have the proper sized air cells without moisture, heat at 103. We will now add a small quantity of moisture and at the same time increase

the ventilation to such a point as will maintain our eggs or air cells the same as they were before, and what is the result, or where does the benefit come in? First, we get the heat more rapidly diffused, and consequently a more uniform temperature. We get a softer heat, we increase the ventilation and so get a larger amount of oxygen. We get stronger and more vigorous chicks and larger average hatches. I have hatched as large percentages without any moisture as I ever did with it, but on a number of hatches I never could make as good an average, and very seldom did I get as good chicks. Here you have the whole case in a nutshell. Give abundant ventilation, all you can without destroying the uniformity of the temperature, and just enough moisture to balance, and you will get more and better chicks than by squeezing the ventilation down to the lowest possible limit. It should be even and regular, but no drafts.

TEMPERATURE OF THE INCUBATING ROOM.

This is the most important factor to be taken into consideration in determining the proper amount of ventilation. For instance, suppose the room to be 40 and the incubator 103. You would get as much air through your incubator with a half inch auger hole in the top as with a six inch hole with the room at 98 and incubator at 103. When the room and the egg chamber are at the same temperature there is no circulation at all. In such a case the only plan is to open up the machine. I once made a hatch when for five days and nights the egg trays sat on a table and the eggs never got below 105. That was the time that hundreds of people died from sunstroke in all the large cities of the country, the hottest weather I ever remember.

To undertake to say just what sized openings should be used for any certain sized incubator, and at any certain temperature, would be useless, because each hatch has to be its own and only guide. So many things have a bearing that a rule which would fit all cases would be impossible to make. Too many factors have to be taken into consideration, the size of the eggs, thickness of shells, humidity of air at the time, climatic conditions, elevation above sea level and many other things too numerous to mention, so that we have again to fall back on the eggs themselves, and like almost everything else, the simplest and easiest plan is the best. The size of the air cells is just as perfect a guide for the amount of ventilation as it is for the amount of moisture.

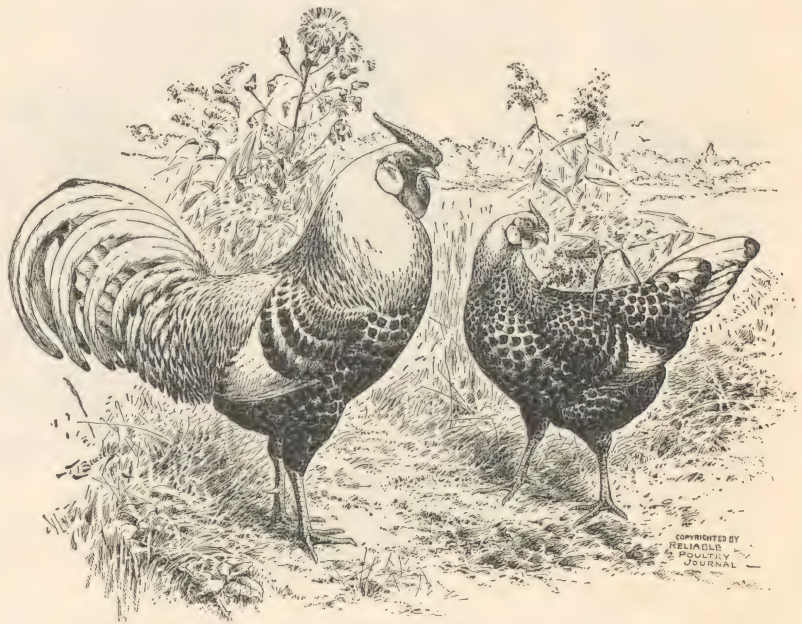
There are just two evils which result from too much ventilation. The first and greatest is that it makes an uneven temperature, and the other that it dries out the eggs too fast. It should be a tolerably easy matter to steer clear of both of these. And incidentally it also makes the machine harder to heat and keep hot, but that is a minor consideration as compared to the other two.

WHEN TO APPLY MOISTURE.

This will depend to a great extent on the eggs and conditions of the surroundings, amount of ventilation, etc. I do not wish to convey the impression that I am a fresh air crank. While I believe in pure air and plenty of it I do not belong to that class of persons who think it necessary to keep a door or window open in cold weather when they have to keep a fire to keep warm. Very few living rooms are ever made so air tight that they will not be properly ventilated with doors and windows shut when a good fire is burning. The very fact that the fire does burn shows that the supply of fresh air is ample. No person can ever really suffer for want of fresh air in a room

where a fire or a lamp will burn brightly and freely. The draft up the flue is bound to draw in a supply in any ordinarily constructed house.

With perfectly fresh eggs, weather neither wet nor dry but normal, a very little moisture applied on the fifth day and ventilation just sufficient to produce the proper sized air cells, will always give good results if the heat is kept right. But you must bear in mind that the construction of your incubator always has a most important bearing on the results of operating by this method. The amount of ventilation that it is possible to give some machines would make it entirely too moist to use any as early as the fifth day, and this must always be taken into consideration. It is usually the safest plan to follow the instructions of the maker of any incubator, for the very good reason that each one ought to know best how to run



SILVER SPANGLED HAMBURGS.

POPULAR WEIGHTS { Cock, 4 pounds. } No Standard Weights.
 { Hen, 3 pounds. }

Characteristics—Cost of raising to maturity, \$0.40. Annual cost of keeping, \$0.75. Average egg yield per year, 180. Average number of eggs to pound, 12. Tender constitution. They are good as foragers; can stand confinement; are non-sitters and are poor as mothers. Grain and flavor of flesh of the best.

his own machine, but the fact remains that some of them do not. In this connection it can be stated that any incubator which has ventilators so small that a little moisture could not be used from the fifth day onward will not be spoiled by increasing the size of the opening. I am well aware that the term little, so much used in this connection, is rather indefinite and liable to be misconstrued either way, yet it is a difficult matter to make it more definite. It would not do to lay down a rule to always use a certain sized pan for a certain sized incubator, or certain number of eggs, because all the local conditions must be taken account of, the state of weather at the time, also the number of eggs in the incubator. It goes without saying that an incubator made to hold 200 or 300 eggs would require less moisture when it was full than if only half full, and that a pan say equal to 100 square inches of surface would give very much more moisture if placed up close to the tank, than if placed under the egg trays, so you see that the location of the pan has much to do with this point. In general terms I would say that 100 square inches of pan surface placed in such position as to be acted on only by the temperature of the egg chamber, would, for a 300-egg machine, be about right. This would be merely approximately correct, because at times you would need to cover at least half of this pan, and again the whole pan would not be enough.

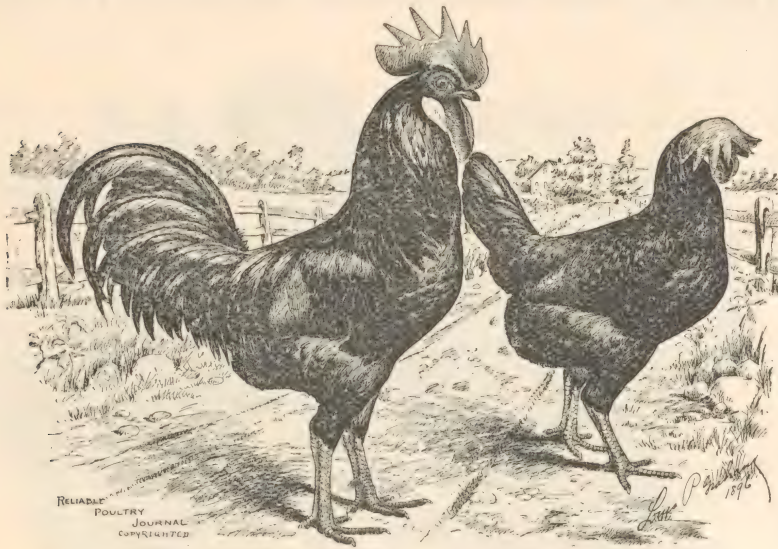
Each operator must learn to use his own judgment to a great extent so far as details are concerned, but the desired result to be gained is so plainly and easily determined that even the novice need not make a mistake on that point. No matter how great a difference is required to be observed in the same machine for two different hatches, whether moisture is used at all, the size of the air cells is an infallible guide. The proper sized cells will vary from one-fifth to one-third of the entire contents of the eggs, the average will be about half way between these two extremes, and while there will always be some eggs with the minimum and some with the maximum sized cells the larger part will always strike the average. Because an egg with a very small or very large cell will hatch does not prove that a different sized cell would not have been better. I can hatch ninety per cent of the eggs and have the

Then if the cells are kept the proper size and the eggs shifted in the trays a few times so as to place the center eggs to the outside, and the outside ones to the center, it will greatly assist in making the hatch come off evenly. It is all right for makers to claim that they have the same temperature in all parts of the egg chamber. It can be made so that eggs will hatch in all parts of it, but I have never yet seen an incubator which could always be kept perfectly uniform in all parts of the trays. The only time it can be done at all is in warm weather, and in cold weather measurably so only by using the smallest allowable amount of ventilation. Therefore it is always best, except in very warm weather, to even up the eggs by changing them around in the trays. I have always used this method as it has a very important bearing on the moisture question. If the eggs have been well evened up and

made to hatch all at once as nearly as possible, the evaporation or moisture supplied by the eggs and wet chicks will usually be amply sufficient, and it is a fact that this moisture supplied by the eggs and chicks is much better for the hatch than when it has to be supplied with pans of water. But if the eggs during the whole period have been kept at such uneven temperatures that they will be two or three days coming out, it is only in wet and very damp weather they can be gotten out without using moisture. No more ever should be used at any time than just enough to prevent the chicks drying fast and sticking to the shells.

Another point of great importance is this, if the air cells are once allowed to become too large no amount of moisture which can be given will ever restore the eggs to natural conditions. The evaporation which takes place from the eggs is not all water. You can take dried grass, or dried fruit and restore as much water as they had when fresh, but they can never again be made to taste like fresh. Something else went along with the water, and the egg is an exactly parallel case. If your eggs have been dried out too much you can, by using a great deal of moisture, bring the chicks up to normal size again and make them hatch out,

but they are not the same kind of chicks they would have been if the cells had been kept the proper size. The chicks have lost some vitality, and this loss is exactly proportional to the amount of over drying out which has been done. The growth of the chick is almost entirely from the white of the egg, because the yolk is almost whole in a freshly hatched chick, and this is almost invariably absorbed after the chick pips the shell. Consequently if the egg is dried out too much the volatile parts of the albumen or white, which are vital to the growth and strength of the chick, are so diminished that not enough is left to produce a strong, vigorous chick, while on the other hand if the egg is not dried out enough, the chick, if it hatches out at all, will be very large and soft and in two or three days after hatching will be smaller



BLACK MINORCAS.

STANDARD WEIGHTS { Cock, 8 pounds; Cockerel, 6½ pounds.
Hen, 6½ pounds; Pullet, 5½ pounds.

Characteristics—Cost of raising to maturity, \$0.70. Annual cost of keeping, \$0.80. Average egg yield per year, 180. Average number of eggs to pound, 9. Hardy constitution. They are good as foragers; can stand confinement; are non-sitters and poor as mothers. Grain and flavor of flesh fair.

chicks so small that they will rattle in the shells on shaking them at hatching time like a rat tail in a quart measure, but the chicks will most all die shortly afterwards, and those that do live will be runts. On the other hand they can be hatched when so large and plump that it is not possible for them to get out without help. Neither of these extremes is right. The chicks should just fill the shell full enough so that they are not jammed and can turn readily. Such chicks will get out without any help, and will live after they do get out. The sitting hen uses no moisture and an incubator can be made to hatch without using any, but neither proves that moisture in an incubator should not be used. During the past four years I have made a practice of setting some hens, and then giving them incubator chicks to raise along with their own, and the incubator chicks have made a better average than those hatched by the hens. As long as both are properly hatched there is not a bit of difference. The old theory that the hen imparts vitality to the chicks in the shell is all a perfect humbug, yet plenty of persons still believe it.

MOISTURE AT HATCHING TIME

Between having too much or too little moisture just when the chicks are coming out there is not much choice, but it is a fact that a hatch is very often lost or greatly curtailed by ignorance on this point. If the eggs have been properly handled all through the hatch and kept just right, but little moisture is usually required while they are hatching out. We are always taking it for granted that the heat is kept right.

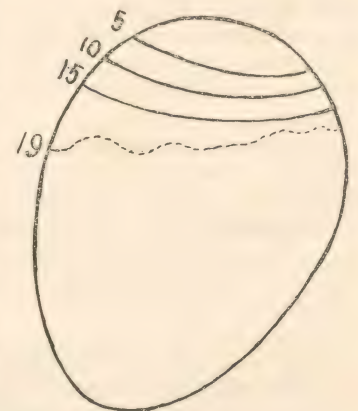


DIAGRAM OF EGG

Showing correct average size of air-cell on the 5th, 10th, 15th and 19th days.

than when it came out of the shell. This is because it is composed largely of water which should have been evaporated during the incubating period.

A few words in regard to the circulation of the blood come properly right here, and I wish to state that I have never yet read what I consider a proper statement of just how the blood does circulate in the embryo chick. I am of the opinion that there is still room for argument as to whether the heart or the capillaries force the circulation, but that has no place in this connection. In every animal in which blood circulates we find four mediums—lungs, heart, veins and arteries. The capillaries are simply a continuation of both veins and arteries, and are of two kinds—those which convey the arterial blood to the tissues, and those which bring the venous blood back to the veins and thence to the heart.

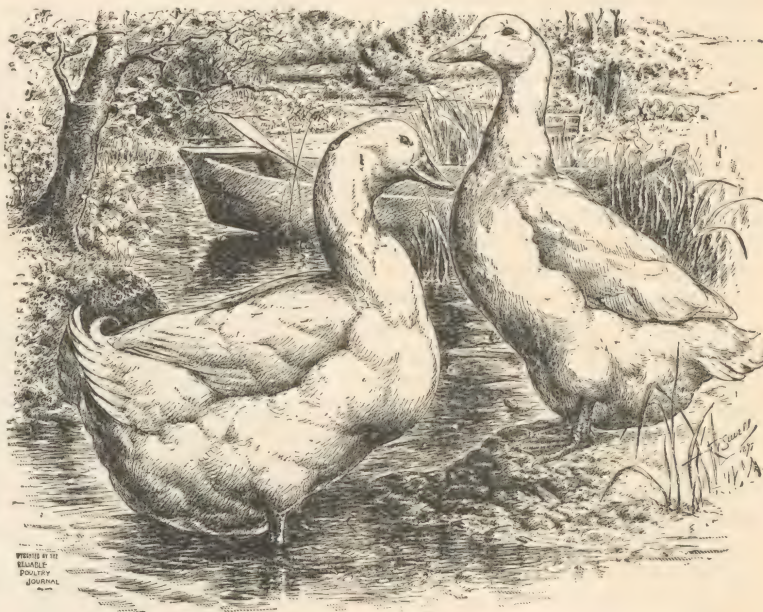
Now our chick while it is growing in the shell has to have a supplementary pair of lungs and this supplementary set of lungs forms and is at work before even the rudiments of the real lungs are formed or visible. The first indications of them are the small network of blood-vessels which forms in a circle around the germinal disc, and then extends latterly until it eventually spreads all over the inner side of the shell and the inner side of the vitelline membrane. This network of veins, blood-vessels, or arteries whatever they may be called, which can be seen on the shell after the chick is out is what composes the supplementary set of lungs. They are what perform the same functions which are performed by the real lungs inside the body of the chick after they become large enough to operate, which is never before the seventeenth day of incubation, and never before the chick begins to breathe through the nostrils which any person must admit is impossible so long as the entire embryo is covered with water or albumen. Prior to this time the blood of the chick must receive its entire supply of oxygen by means of this network of blood-vessels covering the inner lining of the shell or vitelline membrane. This oxygen is supplied both from the outer air surrounding the eggs and from the open air cell in the large end of the egg. If the air cells are allowed to dry out too large serious evils will result. Some of these have been enumerated before, but one of the most serious is that the supply of oxygen is diminished.

The circulation of the blood in the embryo is as follows: We will start at the heart. The venous blood is forced into the supplementary set of lungs, is there oxygenized and forced into the arteries back to the heart and thence through the body of the embryo and back again to the heart to go the same round again. This method of circulation is kept up until about the seventeenth day when the chick gets its beak into the air cell and begins to breathe, the lungs inflate and the circulation begins to act slowly and gradually as it will do after the chick is fully formed and ready to leave the shell. The change is not instantaneous but takes place slowly, and as it increases the chick requires more and more air, and when it can no longer get enough inside of the shell it breaks a hole simply to get more. The change then goes on very rapidly after that. The supplementary lungs soon cease entirely to perform their functions because no longer needed, and the blood they contain is nearly all soon absorbed into the general circulation. Then the chick is ready to leave the shell.

If now through too high temperature, too much ventilation, the air too dry, or a combination of any or all of these the eggs are dried out too much, it has an effect on the blood just in proportion to the extent of the drying out. The vitelline membrane separates and brings the blood-vessels away

from a close contact with the shell thus diminishing the supply of oxygen which the blood can receive. Sometimes the separating process will rupture a blood-vessel and the embryo bleeds to death at once. This however does not occur until the eggs have been dried down away beyond the extreme limit of safety, but it is always injurious to the embryo when carried beyond proper limits.

It has been stated that the embryo chick receives its entire supply of air from the air cell in the large end of the egg, but that is a mistake. Eggs will sometimes hatch if the large end of the egg be sealed up, but they never will if the balance of the shell is also sealed. They do receive a good part of the oxygen from the air cell through the vitelline membrane, but not all by any means.



IMPERIAL PEKIN DUCKS.

STANDARD WEIGHTS { Adult Drake, 8 pounds; Young Drake, 7 pounds.
Adult Duck, 7 pounds; Young Duck, 6 pounds.

Characteristics—Cost of raising to maturity, \$1. Annual cost of keeping, \$1. Average egg yield per year, 120. Average number of eggs to pound, 5½. Hardy constitution. They are fair as foragers; can stand confinement; are good as sitters and mothers. Grain and flavor of flesh good.

AIRING OR COOLING THE EGGS.

Some makers of incubators and others lay down the rule which is to be as unalterable as the laws of the Medes and Persians, that eggs should be aired or cooled off daily after the second day. Others state that no airing is ever needed. I do not and never did agree with either. Under certain conditions airing is beneficial; under different conditions it is a positive injury. It is absolutely necessary only when eggs have been overheated. In warm and hot weather a certain amount of airing or cooling down is a positive benefit; in cold weather it is not only necessary but very often a positive injury, not only in curtailing the hatch, but is also detrimental to those which do hatch. I have hatched large numbers of chicks in all kinds of weather without airing them at all, and proved to my own satisfaction that eggs can be hatched in the largest possible percentages by being kept at a perfectly uniform heat through the entire hatch, and the chicks will be as healthy and vigorous as any that ever were hatched, but to do this the eggs must never be allowed to get too hot or too cold. Any time that eggs become too hot the only proper thing to do is to immediately cool them down again. This is really more essential than it is to warm them up after they have been cooled down.

Whenever the temperature of the hatching room rises

above 70 degrees it is a benefit to cool down the eggs. It should be done from two to six times a week, owing to the heat of room and temperature of eggs, and especially so any time the eggs are allowed to get too warm. From 65 and downwards in the room the eggs get all the airing they need when being turned, tested, etc., always bearing in mind the fact that the only proper thing to do is to cool them down at any time when they have been heated above 105.

WHY CHICKS DIE IN THE SHELLS.

There are various reasons for this, improper temperature being the principal cause. More are lost from this one reason than all others combined. Many a hatch is lost by overheating or underheating and the operator is positive that the heat was exactly right all the time! A correct registering thermometer would have shown where the trouble was. It may be safely laid down that as a rule if the heat is kept right and eggs are good, a fair hatch will be obtained almost regardless of other conditions. There are a number of other causes which all help to swell the total. The fault may all be in the stock which laid the eggs, or it may be in the way the eggs have been kept before placing them in the incubator. Eggs which are intended for hatching should be gathered twice a day when it is intended to keep them any longer than three days because the hens sitting on the nests all day start the germs into active life, in fact the activity begins as soon as the germ and egg come together and does not stop until the egg is cooled down to at least 60 degrees. This does no harm if the eggs are set soon after being laid, but if kept a week or two or perhaps longer the eggs may either prove to be addled or the chicks may die in the shells. The old story of the hen laying fifteen eggs and then hatching every one of them is easily answered. She does not do it, not often. The usual average when a hen steals her nest is six or seven chicks. Not more than once in twenty times does she reach a dozen. If the eggs are taken from her as she lays them and kept in a cool place and then put back when she is ready to sit she will bring out the twelve to fifteen chicks every time. I have tried both letting the hens alone and taking away and then replacing the eggs, and I know which method will produce the most chicks. The few exceptional cases only prove that the hen happens to select a good place for the nest and that she is exceptionally strong and vigorous.

Overheating eggs just at the start may show no bad results until pipping time, then from that cause alone a great many chicks may die in the shell. The food of the hens has much to do with it. Feeding stimulating food to make hens lay beyond their normal capacity will not produce good hatching eggs, and the chicks will die in the shell. Too low a temperature all through the hatch will cause the chicks to die, but this can be told because they will live away over time. When they die from too much heat they always die before or about the end of the twentieth day. Lack of vitality in the germ causes them to die, but there are so many reasons for this that it is not always easy to say just what it is. Many die from drowning. They have the head in the wrong place in the shell and although as good as any chick in the machine, when the time comes that they are ready to breathe they can get no air and soon die. A chick which has its head in the air cell and chips the shell there always gets out if it is a good chick. If it dies in that position it would have died anyway, provided always of course that the heat was right. Whenever chicks are found in the shell full grown and perfect, yolk absorbed and nothing at all wrong that can be seen, then that chick died either from overheat or want of air; not once in a thousand times is it anything else. But if the chicks are imperfect in any way, then the cause must be looked for elsewhere. Too much or too little moisture, too much or too little heat, unhealthy hens, overfed hens, too much stimulating food, such as red pepper, condition powders, impure food, all these things add their quota to chicks dead in the shells. It may

not show until pipping time arrives, which is the day of judgment for all these evils. One of the most vital necessities, if eggs are for hatching, is pure water. Filthy water is injurious at all times, but especially so if the eggs are for hatching.

STICKY OR GUMMY CHICKS.

This is caused by pretty much the same reasons which make the chicks die in the shells, not always however. As good a chick as any may be daubed all over with the stuff. There is more or less of this substance in every egg when the chick comes out. It is the heavy part of the white or albumen, the chalazæ. If the chick has its head towards or in the small end of the shell it is liable to get this stuff all daubed over it and in that case if the chick is all right otherwise washing it off is all that is needed, but when it is caused by lack of vitality in the germ, overheating or underheating the chick is always worthless.

CRIPPLED CHICKS.

Anything which causes the chicks to stay in the shell too long is apt to cause them to grow crooked or cramped up, or the toes to be drawn up in a bunch. Very few of such are ever seen among chicks which get out on time. It is always the late comers that are crippled when it is the fault of the hatching. Chicks are often imperfect from natural causes, and would have been imperfect no matter how hatched, but when all cramped up in a bunch, such as crooked toes, twisted necks, cramped up legs, etc., if the chicks are perfect otherwise it will nearly always be caused from staying in the shell too long. Nothing will or can be worse to make them late coming out than to let the heat run low at hatching time. It should never be low, it must never be too high; 102 is the lowest, and 105 the highest to get them out on time.

WHY CHICKS DIE AFTER HATCHING OUT.

The very same reasons in a lesser degree, which cause them to die in the shells will cause them to die when out of the shells, with the additional one added of improper brooding and feeding. You can lay it down as a rule that has no exceptions, that if your chicks are all right in every respect when hatched out and then die off in a week to a month, that you need not look farther than the brooding and food, it is one or the other or both. Or if there is any exception at all then it is lice, but it is one of the reasons stated.

PROPER ATTENTION AT HATCHING-OUT TIME.

It is a fact that a good many chicks are lost by improper handling of the incubator at hatching out time. Some makers advise shutting up the machine as soon as the chicks begin pipping and not opening it again until all are out. This is rather heroic treatment, but is really better than to keep fooling with it five or six times a day in any and all kinds of places. The real facts of the case are that good eggs properly incubated all through the hatch will stand almost any kind of treatment at that stage and still hatch out all right, and it is also a fact if the eggs have not been handled exactly right that it requires the greatest care at that time to get out as many as ought to come.

The best method of all is to open the machine as little as possible, but after a good lot of the eggs are pipped they should be turned with hole up, and placed next to the doors, then by watching, those that can not get out can be helped if worth helping, without having to remove the trays at all, and by only having the door open a few seconds the machine does not cool down. Of course the most of the good chicks get out without any help at all but often they can break the shells but not the lining, and must either remain cramped up until the hatch is over or die from exhaustion, one being about as bad as the other. The moisture made by the eggs evaporating should be kept in the machine as far as possible, as it is much better than moisture made by evaporated water. The worst possible day to get out a good hatch is a very hot one, because the chicks smother so easily at such a time, so that the smallest possible amount of moisture that will answer should be used on a hot day. I prefer above any other kind of weather a cool, pleasant day, especially if a nice breeze is blowing. On such a day as that chicks seem to be and are much stronger than on a hot day. The worst of all days is one that is called in common parlance "muggy," that is, a hot day with air saturated with moisture. Chicks will die (smother) on such a day as that without the slightest provocation that you can see. When I have a hatch coming off on such a day or night as that I stay with them. When the day is cool and pleasant they can hoe their own row pretty much as they like and they will get out all right, but the all-important thing is to keep the heat just right, and supply enough air so they will not pant any before they get perfectly dry.

J. L. CAMPBELL.

MICHAEL K. BOYER.

with broiler men, but the large single combs would crop out in the cockerels. The objection to a large single comb is, that it is apt to carry the conviction that the bird is older than a broiler should be. We once tried the cross of Black Minorca on Black Langshan, for a special trade in New York City, where white-skinned birds were wanted. We got a fine broiler so far as growth and plumpness were concerned, but, oh, horrors! when we think of the black pin feathers and the sight the carcass presented after cleaning! We avowed never to use it again. The last lot we would not market, but allowed them to grow up for layers. It was here that they redeemed themselves—we never had better layers than that cross gave.

So our advice is, select a desirable breed or cross, and stick to that alone, and you will find the eggs to hatch better and you will have a more uniform lot of chicks. The most profit comes when you can market at least three-fourths of a brood at from twelve to sixteen weeks of age. To keep them beyond that limit will cut very much into the profits.

MATING UP THE PENS.

Mate up your breeding pens with the same care exercised by the fancier who is breeding for standard markings. Select hens that show a plump breast and broad back, short legs, and such hens as have never been sick. It is imperative that none but strictly hardy stock should be used. Secure a male bird that possesses the same qualities as are found in the hens, and one that in no sense is related to any of the females. Get a new male every year. Above all things, avoid inbreeding if you would have rugged offspring. Nothing under one year of age should be used, while two year old hens mated to one year old cocks will give the best results. For strong fertility, three cocks to two pens, or two cocks to one pen, will be found excellent. We prefer the three males for two pens. Our plan is as follows: Cock No. 1 to-day is in pen No. 1; cock No. 2 in pen No. 2; cock No. 3 in a pen alone. To-morrow cock No. 1 goes to pen No. 2; cock No. 2 goes to a pen alone; and cock No. 3 is put in pen No. 1. So they are changed each night, until through breeding, when the males are entirely taken away from the females and kept separately.

In the case of two cocks for one pen, we alternate them each night never allowing the two males with the females at the same time. Where we use cock birds in alternation, as described, we find we can use more females in a pen, providing in doing so we do not overcrowd. The past season we used matings as follows: Light Brahmas, fifteen females; White Wyandottes, twenty females; and in a pen of White Leghorns, kept solely for eggs (for hatching and table use) we used thirty females. So by alternating males we have a gain in females to pay us for our trouble. Our eggs ran from 80 to 95 per cent in fertility.

The secret of this plan is this: Hens with one male for the season are mated according to the ideas of the owner, and not according to the likes and dislikes of the hens themselves. When the male is compelled to force his attentions on the female, the power is lost. In every case where the invitation to copulation is extended by the hen, fertility is assured. By changing males the chances are increased that the new male will be more to the liking of the hen than the rejected suitor. Again, on the part of the male, he is apt to have his favorites, shunning the rest. In consequence, we get fertile eggs from the one class, and infertile from the other. Again, the male resting one day out of three will make him more vigorous and keep him in a better condition. One male in a flock the entire season is apt to become sluggish. In such cases it is not uncommon to have one lot of eggs hatch well, and another lot from the same pen give poor results.

FOWLS SHOULD BE KEPT BUSY.

But there is another point that must not be lost sight of in order to produce fertile eggs. Even if we keep on changing

males we can not expect the best of success if we allow our hens to idle away their time. They must be compelled to exercise. Exercising keeps them in prime condition, it warms up the blood, and it aids digestion. All this is of great importance during the long winter months. For that reason we want our breeding stock yarded. We believe in generous sized runs—not less than one hundred feet in length, and as wide as the pen will permit. We likewise want a scratching shed attached. We keep these scratching sheds bedded at least four inches deep, and when we throw the grain among the litter it at once falls out of sight. But the hens find it; they scratch, and peck, and sing—and thus busy themselves from morning to night. These sheds we have so arranged that the hens can enter them the first thing in the morning, as soon as they leave the roost. When we close the houses at night we scatter several handfuls of wheat among the litter which the hens work for before we have their breakfast ready. There is a double benefit in this: they get a better appetite by their working, and it gives us a chance to first attend to the wants of the brooder chicks. It is about eight o'clock before they get their mash, and they are none the worse for it, as they have found sufficient grain among the litter to partially satisfy their hunger, and prevent worrying for food.

Outside in the runs we have a space about one-quarter the length of the yard, which is also thickly bedded with litter. When we go to feed the mash (if the weather is not stormy, and if there is no snow on the ground) we let the fowls out in their runs and give the mash in troughs. Should the weather be stormy or snow on the ground, we feed them indoors, and raise the curtains in front of the scratching pens so as to let in the cold air. We never allow the fowls out in other than clear weather. Don't be afraid of the cold; hens exercising can stand more of it than the average man. We might add that our scratching sheds are enclosed on the south side with one-inch wire netting, and a curtain on a frame covers this at night, so as to prevent snow or rain from driving in should a storm occur. At noon on bright days, we scatter grain among the litter outside, and do the same in the evening, at least an hour before dark. [NOTE—For style of house with scratching sheds, recommended by Mr. Boyer, see article entitled "Laying House with Scratching Shed," pages 32-34.—ED.]

WHEN TO FEED AND HOW.

The *quality* of feed is as important as the quantity. In the daily bill of fare we use wheat and oats, with their by-products, bran, middlings, and oatmeal (or ground oats), and cornmeal. We use whole corn only at night during very cold weather.

Our morning mash consists of bran, middlings, cornmeal, and ground oats, generally equal parts by measurement, but varied according to condition of droppings. To this we add about half the bulk (more when we think it necessary) of either cut clover hay or clover meal. About ten per cent of animal meal is also added. Twice a week powdered charcoal (heaping tablespoonful to a quart of mash) goes in the mixture. We give a limited amount of mash to each fowl. We have a large iron spoon, such as housewives use. We throw in the trough one spoonful for two fowls.

At noon we scatter one good handful of grain in the litter for each fowl. We feed oats and wheat alternated—barley, when we can get it, for variety. We soak the oats in hot water for several hours before feeding, on account of the hulls, and the fowls also relish it all the more.

In the evening we give one handful of grain to each fowl (which is double what they get at noon). For this feed we use the same grains as at noon, only alternated. If we fed wheat at noon, they get oats at night, and so on. During very cold weather we make the evening feed corn.

Every Wednesday and Saturday we give in addition, a

feed of green cut bone. On those days we do not give the grain for about an hour after giving the bone. We also feed cooked vegetables, cabbage and chopped onions whenever we can get them.

We keep grit and oyster shell constantly within reach, and fresh water is given twice a day. In the morning we water after we are through feeding. We add enough hot water to it to take off the chill. The water at noon will generally not be too cold for them. We find that if given water after feeding the bowels keep in a healthier condition, and digestion is better.

The premises are kept perfectly clean—droppings are collected every morning. Dust baths should be provided, although with us the sand in the scratching shed is always loose enough for the fowls to dust in.

We gather the eggs several times a day, so as to prevent chilling. They are carried to the house cellar where the temperature runs from forty to sixty degrees. We place them on

racks made purposely, and turn the eggs every other day. They rest in the racks end down. Under no circumstances would we keep them piled up in boxes and baskets. We also make it a rule never to set an egg that is over three weeks old, and the fresher the egg the better we like it. We select for hatching only those uniformly shaped—never any too large or too small, or those having ridges in them, or those out of shape.

To briefly sum up the management: We have our fowls warmly and comfortably housed. They are regularly attended to, are kept at exercising, are mated to vigorous males, are accommodated by males more to their choice, are fed as much of a variety as possible, are never overfed, are kept from exposure to inclement weather, are never allowed to worry, and are always kept in good health. The eggs are collected four to five times a day, are kept in a temperature not colder than forty degrees, are turned every other day, and only the best shaped eggs are used for incubation.

M. K. BOYER.

CUT BONE VS. ANIMAL MEAL FOR EGG-PRODUCTION.

[From Ninth Annual Report, Hatch Experiment Station, Amhurst, Mass.]

THE experiment to test the comparative value of animal meal and cut bone (green bone) in feeding for eggs was begun February 9, 1897, and continued until April 28.

We used two lots of fowls, selected with the utmost care with respect to similar characteristics in the two lots. Each lot contained three Barred Plymouth Rock hens, eight Light Brahma hens, six Light Brahma pullets and two Wyandotte-Light Brahma pullets. The hens were one and three-quarters years old at the time the experiment began. Each lot, consisting of nineteen fowls, occupied a detached house having two compartments (scratching shed and closed roosting and nest room), respectively 8x12 and 10x12 feet in size, the nest room with two windows. These houses adjoin each other and both have precisely the same exposure. The two lots were fed as follows: In the morning they received a mash which was mixed hot the previous evening; at noon and again one hour before sundown, whole grain was scattered in the straw in the scratching sheds. Artificial grit, oyster shells and pure water were kept always before them.

The leading details and results are shown in the accompanying table:

CUT BONE VS. ANIMAL MEAL FOR EGG-PRODUCTION.

Began February 9, ended April 28.	Duration of Ex- periment.	Total Food Con- sumed.	Cost of Food per Fowl per day.	Number of Eggs Produced.	Dry Matter in Food per Egg.	Cost of Food per Egg.
	Days	Lbs.	.Cts		Lbs.	Cts
Cut bone lot.....	79	283.5	.22	269	.940	1.2
Animal meal lot.....		287.0	.22	145*	1.796	2.2

*One soft shelled.

The food received by the lot having cut bone was as follows (in pounds): Whole wheat, 99.5; oats, 100; wheat bran,

18.5; wheat middlings, 18.5; Chicago gluten meal, 18.5; ground clover, 18.5; cut bone, 10. Total, 283.5 pounds; cost, \$3.25; nutritive ratio, 1 : 4.8.

The other lot received essentially the same foods, except that in place of the bone it got 9.7 pounds of animal meal. Total food, 287 pounds; cost, \$3.26; nutritive ratio, 1 : 4.9.

In the above estimate of cost the labor required to cut the bones is included. The results indicate a decided advantage in favor of the bone. During the last year two experiments were tried, one of which resulted favorably to the bone, the other to the animal meal. Last year there was some diarrhea among the fowls having bone, this being given alone. This year the bone was fed in the mash, and there has been no such trouble. There has been this year no perceptible difference either in the condition of the fowls in the two lots or in the size or character of the eggs produced. The experiment indicates, then, a decided advantage in favor of the cut bone. This experiment is now being repeated.

MR. BOYER ENDORSES GREEN CUT BONE

My fowls are all confined to runs. I can not give them range. I have but two acres of land. It is a long, narrow strip (only eighty-five feet wide) and on each side my neighbors have gardens. They are good neighbors; for me to let my chickens range would very soon make of them bad neighbors. So as I can not give my fowls range, I must make up in feed and management, as a substitute for the benefits derived in freedom. Consequently, I adopted green cut bone to take the place of the bugs and worms found on a range. I use clover hay as a substitute for grass, and I compel exercise by feeding grain. I feed this bone as a separate meal twice a week. I give about an ounce to a hen. They would eat five times the amount if I gave it to them, but I am opposed to overdoing the matter. I am not exaggerating one bit when I say that green bone will double the egg yield. I simply can not afford to do without it. *But it must be fed fresh.* Feed it the day it is cut. Tainted meat is as dangerous as sour food.

We feed the bone to chicks of all ages over one week. They thrive on it, and it is not so dangerous for them as are some kinds of insect life.

Respectfully,
M. K. BOYER, Hammonton, N. J.

LAYING HOUSE WITH SCRATCHING SHED.

Claimed by Experts to be the Best Style of House Known to Poultrymen.
Full Description, With Bill and Cost of Materials.

BY A. F. HUNTER, SO. NATICK, MASS.

Editor Farm-Poultry, Boston.

WE give herewith a drawing of our scratching shed plan of poultry house, with details of construction, and a photographic view of a house of this kind in use on the writer's poultry farm. A house on this plan can be built of any length desired, the pens and sheds being in groups of two, with doors opening through from pen to pen and from shed to shed, so that the whole house can be passed through without going out of doors. Each roosting room is 8x10 feet, and each shed (adjoining) is 10x10 feet, the front being 7 feet high, the back 4 feet high. We advise these heights because a 6 foot high front makes doors rather too low for a tall (or tallish) man, and head bumps should be avoided if possible.

Some will ask, "Why not the walk at the back?" There are several reasons why we prefer the greatest height in front. First, economy. The walk at the back adds three feet to the width of the house, and increases the height at back by two feet, increasing the cost about a fourth (twenty-five per cent), and we don't think the corresponding advantages balance the disadvantages and added cost. Having the walk at the back, we must have six feet of height there, adding not a little to the cold temperature in winter. We must also have a door at the end of each pair of roosting pens, or else a solid partition (and door) between walk and scratching pen. True, we could have the double-pitch roof, or the long and short pitch roof, with the apex over partition between walk and pens, but to get the desired seven feet height of front we would have to boost the roof up into the air two feet, making the house much colder. We very much want that seven feet height of front; then, in winter, when the sun doesn't climb high, the whole floor of the scratching shed is bathed in sunshine. The shed having a tight roof, and being tight on the north and west, is all open to the south (when the curtains are up), giving the birds fresh air and sunshine, at the same time that they are protected from our cold northwest winds.

By this plan of house, too, the roost and roost platform are at the back, cut off from winds and drafts, and at the same time the roof is but about two feet above it. A curtain can be hung above front edge of roost platform, extending almost down to it, and this, let down on cold nights, encloses the birds on the roosts, keeping them snug and warm. We would have the north wall of this roosting pen double boarded so as to have a dead air space; the inner boarding being of matched boards, the outer of cheapest rough boards covered with two thicknesses of Neponset paper; red Neponset roofing outside, and sheating paper underneath that, next the boards.

This shed and pen plan of house will give the best results for dollars expended. Each combined pen and shed is 18x10 feet, and will well house twenty-five fowls; and as it is the most economical plan to build upon, it is easy to see that it is by all odds the best for the man who has to make his dollars go as far as possible. For these reasons we recommend this compact open shed and roosting pen plan of house as being the best all-round house that can be built. We have one hun-

dred and eight feet (in length) of this house on our farm, and find it just about perfect.

CONSTRUCTION.

We intend that the top of the sills of our house shall be about a foot above the ground level (we fill inside to bottom of sills, and slope up the ground outside to nearly same height). The sills are 2x4 scantling, halved and nailed together at splices and corners. The sills rest upon posts of cedar or chestnut, which go into the ground about two feet; if it is a three foot length of post it will go into the ground two feet two inches, and extend above the ground ten inches. There should be one at each corner of pens and sheds, and also one between each of these—giving a post to each five feet of front of sheds, and each four feet of front of pens. It will strengthen the building not a little to have one in the center of each cross partition, also, although that is not vitally necessary. Instead of posts we sometimes use pieces of scantling about eighteen inches long, reaching to stones set down in the ground to about the right depth. In that case the stone is the foundation, and the piece of scantling is a "stilt" to support sill. A board a foot in width is nailed along lower half of sill, extending into the ground three or four inches; the ground is "channeled" to receive it. This board laps one inch onto sill (leaving the other inch of sill to nail upper boarding to); it is also nailed securely to foundation posts, or stilts. In a country where small stones are plenty, a stone wall foundation, ten inches high, will be easy to build, and will be cheap.

The plates are 2x4 scantling, same as sills, and are halved and nailed together at splices and corners. A sufficient number of studs six feet eight inches long for the front, and three feet eight inches long for the back, are cut from the 2x4 scantlings, one for each corner of the pen and shed. These are toe-nailed onto sills, and the plates spiked onto top of them. We set an intermediate stud in front of each scratching shed, preferably of 2x4 stuff (though 2x3 will do), and two 2x3 studs in front of roosting pen set the right distance apart to receive the window intended to be used. At the back we use one intermediate stud of 2x4 stuff in each pen and shed. As we purpose double boarding this back wall, boarding on the inside of studs with matched boards, we use the 2x4 studs, and thus get the four inch dead air space; a 2x3 intermediate stud would give a three inch air space only, but would bring inner boarding flush with outer edge of corner studs, if one preferred that finish, a strip of furring being nailed onto side of corner studs to nail ceiling boards to.

Rafters are of 2x4 scantling, notched and spiked onto plates, the top end cut flush with outside of plate, the lower end projecting about eight inches, and mitered to nail a gutter to. It is best economy to set rafters two feet apart, as boards come ten, twelve, fourteen or sixteen feet long, and having rafters two feet apart saves cutting boards to waste, also makes a stiff roof. All outside boarding is lengthwise of buildings, and is cheapest hemlock boards, put on with as slight cracks

as possible, then covered with, first, black Neponset sheathing; then, second, Neponset red rope roofing. This is put on lengthwise of building, also, each strip lapping about three inches, and secured with the tin head nails provided with each roll. The tin head nails should not be over three inches apart, and about a fourth inch above the edge (back from the edge) of top lap. We add battens, stripped one-half inch thick from seven-eighths inch boards, putting them on over the rafters, two feet apart. We give the roofing paper a coat of paint, and also paint the battens before putting them on, then put on a second coat of paint over battens and all.

A twelve-light window of 8x10 glass is set in the middle of front of roosting room, and a half-window (six lights, 8x10 glass) is set in each partition between shed and pen. This, however, may be omitted if one prefers. The whole window, in the front, is better for being set in a window frame, so the lower half can be raised in hot weather. All our windows are protected by having wire netting tacked to frame on the

The roost platform is three feet wide, as long as will go easily in between the partitions, and rests upon strips of furring securely nailed to the partitions, the top of roost being twenty inches above floor. The platform we make of matched boards, and edge it with a strip of furring all around, so that it is a shallow pan one and a half inches deep. The two roosts are of 2x3 scantlings slightly rounded on top, and are fifteen inches apart, the rear one being ten inches from the back wall. These are secured to two strips of furring, which are hinged to the wall at the back six inches above platform, and two six inch long legs at the front end of these cross pieces are the front supports. Hinged at the back the roosts can be tipped up out of the way when one wants to clean (or remove) the platform, a hook and screw-eye securing it up against the roof. We cut the roosts six inches shorter than the roost platform, so they come three inches within it at each end. The nest boxes are set under the roost platforms so the fowls can go round the ends and enter any apartment from the



LAYING HOUSE WITH SCRATCHING SHED.

Favorite Style of Continuous Open-shed Poultry House on Cleft-Rock Poultry Farm, A. F. Hunter, Proprietor, So. Natick, Mass.

inside; this is as much to prevent the fowls flying against and breaking the glass as to keep cats, etc., out when window is open.

The partitions between two scratching sheds are boards up to a height of two feet, then wire netting, the two feet wide door being of light (furring) frame and same materials, two 2x3 studs, one to shut door against and the other about half way between door and back. The same studding supports the partition between sheds and roosting rooms, one stud supporting the door, the other being set to support the half-window. The partitions between roosting pens have two studs, one to shut door against and the other half way to back; this partition is boarded up to bottom of rear plate and then wire netting above, for ventilation. In warm weather the doors to open sheds are left open, being fastened back by small hooks and screw-eyes; these, with the open slide doors (through which the chickens pass from the pens to the sheds), and open windows, give excellent ventilation. The ventilators in top of doors between sheds and pens can be left open in cool (not cold) weather, and the slide doors to sheds being left open in cool weather, give additional ventilation. The ventilators in top of the doors are simply part of the top of the door cut so it may be opened when the door is closed.

back, the front (hinged at top and secured by a simple button at the bottom) lifting up to allow the removal of the eggs. Keeping this front closed makes the nests dark and secluded, the most important aids in preventing the forming of the egg-eating habit.

THE SHED AND CURTAINS.

We made the scratching shed 10x10 feet, and plan for two curtains $4\frac{1}{2} \times 5\frac{1}{2}$ feet to close the front. Both these curtains can be hinged to right and left, the right hand one being a door to admit to shed, and thence to pen; or they can be simple curtains on frames secured by buttons, excepting that the shed at end of house must have a door for entrance.

The curtains we have used have been simple muslin (cotton sheeting) tacked to frames of furring strips, the muslin being oiled with linseed oil after being tacked on. One drawback to this is that the oil oxidizes, rotting the muslin in a couple of years, and we purpose shellacing the next curtains we make. A simple process of water-proofing is desirable. A water-proof sheeting suitable for these curtains is usually on sale at seed stores.

We have seen these curtains hinged at top, swinging out and up. This exposes them very much to high winds, and unless they are swung high up they cut off the desired sun-

shine. The poultryman who tried that plan didn't like it, and doesn't recommend it. A better plan (and probably the best) is to have the curtains hinged at top so as to *swing in and up along the roof rafters*, where a hook secures them. This plan has many advantages, not the least of which is having the curtains hung up out of the way all summer, when they are not wanted. Care has to be taken that the doors between pens and sheds are cut sufficiently low not to interfere with the curtain; or, rather that the curtains are up out of the way of the doors. Another thing, they should swing well out to front of studs (almost flush with front of studs), and the eight inch wide board at the bottom should be inside of (within) the drip from the curtains, else when it rains against the curtains they will conduct the water *into* the scratching shed; that *must* be avoided. We put a six inch wide board along the top of front of the shed, covering end of rafters and front of plate, for finish. A similar board, eight inches wide, is nailed along the bottom, to secure scratching material within and keep water out. If the curtains swing in it would be well to slant this bottom board, from flush with outer edge of sill to within the drip of the curtains, when it would conduct that drip outside the sill.

CONCLUSION.

We strongly recommend this open front shed and closed roosting pen plan of house as being far in advance of all other poultry house plans. We have tried one for three winters, housing thirty birds in a house 10x24, the shed being 10x12, and pen ditto. The birds wintered in that scratching shed house have been the brightest, healthiest, and laid the best of any on the farm, and we have come to believe the open front shed and pen the best plan yet. The long house divided into pens 12x12 with a walk at the back is a *good* house, far and away above most poultry house plans, and has, here and elsewhere given excellent results. The point we want to especially emphasize is, that the scratching shed house is much better than any other. The open front shed gives fresh air and sun bath, invites to exercise, and promotes the animal well being; it is by all odds the best plan yet.

One objection offered to this plan and size of pen, is that twenty-five birds are too many for one male, hence these large pens are not well adapted for breeding stock. The consensus of opinion favors about twelve females to a male of the medium breeds, and about ten of the larger breeds. We purpose putting twenty to twenty-four females in these pens, having two males for each; running one male in the pen for two days, then the other for two days; the male that is out being in a coop by himself and "fed up" for better service after he has had the rest. This method is employed with excellent results in fertile and hatchable eggs on some farms we have visited, hence it is not an experiment. As not all the pens on a farm are needed for breeding stock, we can cull each pen down to eighteen or

twenty females, temporarily increasing the number in the pens unmated.

Some doubts have been expressed, also, as to the adaptability of this open shed plan of house to a cold and windy country. For example, a farmer in central Maine argued strongly against it at a farmers' institute where the writer was lecturing last winter. He said: "Take to-day, for an example. It's been fair, but a fierce wind is blowing and the snow is flying. That open shed would be drifted full of snow in a few hours on such a day as this!" and a correspondent in central New York writes us that "the open front shed would be blown full of snow in no time." In such case we would not open the curtains, and the fowls would have the fresh air of the shed to exercise in, and that fresh air bath is worth a great deal. There are a few days in winter, stormy or blowy, when the curtains would need to be left down; but those days *are few*—a dozen, perhaps, in a winter. On all other days the shed can be all open front, (the curtains being open by nine or ten o'clock in the forenoon, and closed by two, or three or four o'clock in the afternoon, according to the weather) and being closed on the north and west, gives perfect shelter from our cold winter winds. That word, "perfect shelter," just expresses it, and that perfect shelter means healthy, happy fowls—and eggs in the nest!

LUMBER SCHEDULE.

For house 36 feet long, having two pens and two sheds.

8 pieces 2x4 scantling, 18 feet long	} @\$17.....	\$2.10
4 pieces 2x4 scantling, 10 feet long		
20 pieces 2x4 scantling, 12 feet long, @ \$17.....		2.72
200 feet 2x3 scantling.....		3.40
250 feet matched spruce boards, @ \$18.....		4.50
1000 feet hemlock boards.....		15.00
32 feet 2x3, planed 4 sides, @ \$20.....		.64
2 bundles furring, 16 feet long.....		1.50
2 windows, 12 lights, 8x10 glass, and frames... ..		2.50
2 rolls Neponset red rope roofing.....		10.00
2 rolls Neponset black sheathing... ..		3.00
Wire netting, 2 inch mesh.....		2.00
Waterproof sheathing, 12 yards, @ 15c.....		1.80
Hardware (door handles, hooks, nails, etc).....		1.00
		\$50.16

YARD FENCES.

700 feet hemlock boards, @ \$15.....	\$10.50
350 feet wire netting, 4 feet wide.....	5.80
15 10 feet posts, @20c.....	3.00
	\$19.30

These prices are taken from our lumber bills, and are adapted to the vicinity of Boston.

A. F. HUNTER.



WHAT AND HOW TO FEED.

In Order to Get Fertile Eggs—In Selecting Eggs for Hatching Give the Incubator the Same Chance You do the Hen.

BY A. F. COOPER.

Of the Prairie State Incubator and Brooder Company, Homer City, Penn.

IN order to secure good hatches, good fresh eggs are absolutely necessary. Poor eggs, poor hatches; poor chicks, poor chicks; and if poor chicks are hatched a very poor percentage of them are raised. In order to procure good eggs the laying stock must be looked after carefully. Nothing but good, healthy fowls should be kept, and one can not be too careful in taking care of them in order to produce eggs that will run a large percentage of fertility and produce good hatches, either in an incubator or under a hen. Hens that have to roost out on the trees, on fences, or in a shabby hen house, will not lay many eggs during the winter months, and not twenty-five per cent of them will run fertile. A poor hen house is really worse than no hen house at all. Any building where the wind can blow through, or which gets so cold that the combs on the chickens will freeze, will insure you in each and every instance that it will require but a very small basket to carry the eggs that the hens will lay during the entire winter season. A hen house should be so constructed that it can be kept warm, and during zero weather a little artificial heat should be used in order to keep the chickens' combs from freezing, or the eggs from freezing in the nests. The breeder should also be particular to mark each and every egg that comes from the different yards in order that he may ascertain the fertility of same, and if he finds one or more yards that are showing up a small percentage of fertility, then the male bird should be changed.

The feeding of laying hens is no secret, but, on the other hand, there is considerable in the "knowing how." Overfed hens will lay eggs that invariably fail to produce good hatches, and when the breeder notes soft shells or deformed egg shells, he should know at once that he is overfeeding his hens and a change should be made. We are strong advocates of having plenty of litter in a poultry building. We have never found any thing better than oat straw. Cover the floor of the building with at least a foot of it, and scatter their grains in the same. In this way it gives the hens plenty of exercise through the day, thus keeping them warm and in a healthy condition. Avoid feeding much soft food when eggs are wanted for hatching. On the other hand feed whole grain, such as corn, wheat, buckwheat and oats in connection with ground meat and bone.

Feeding soft food is in our opinion, where a great many make a mistake during the early season. The egg production may be increased by feeding a mixture of egg food, poultry powder, pepper etc., etc., but the eggs will not hatch and a much larger percentage will die in the shell at all periods of

incubation. Forced egg production injures their vitality. Experience has taught us to entirely discontinue the use of all such stimulants when eggs are wanted for hatching. If the breeder will only be as careful in trying to produce eggs as he is after he gets them, there would be no trouble. We admit that in the early season when eggs are very hard to get, too many operators set eggs that will not hatch under any circumstances, either in a machine or under hens.

Do not place eggs in an incubator that you would not place under a hen. For example, when you go to your basket to pick out eggs to put under a hen, no difference if there are fifty or more eggs in the basket you will pick out thirteen or fifteen, as the case may be, of the nicest eggs that you can find. Not so with the incubator, for when you come to set it and

eggs are scarce you will put in one hundred or more eggs of different sizes and deformed shells, and, many times, chilled eggs. They fail to hatch and then the incubator gets the blame. Place eggs in the machine that are as uniform in size as you can get them. Feed your laying stock carefully and provide warm quarters for them.

Do not feed soft food over twice a week, then feed it in the evening. We know this statement is contrary to many authorities, yet in the meantime our experience has taught us that in the evening is the time to feed soft food. If you feed it in the morning the chickens will fill their crops, go sit down on the roost, and take no exercise through the day, while if you feed it in the evening they go to roost and in the morning they are ready for a good breakfast of solid grain food. Figure on plenty of exercise for your laying stock, as there is about as

much in that as anything else. Feed them green food the same as you would broilers. Hang up a head of cabbage in the hen coop, a piece of meat, turnips, beets, or anything of that nature and let the chickens pick it off. This furnishes them plenty of exercise through the day, in connection with feeding them grain in their litter in the poultry buildings.

Have a system for doing your work. Clean out your poultry buildings regularly. Water the chickens often and feed them as regularly as you would expect to eat yourself, and you will be able to carry good healthy stock, which means good eggs and good hatches.

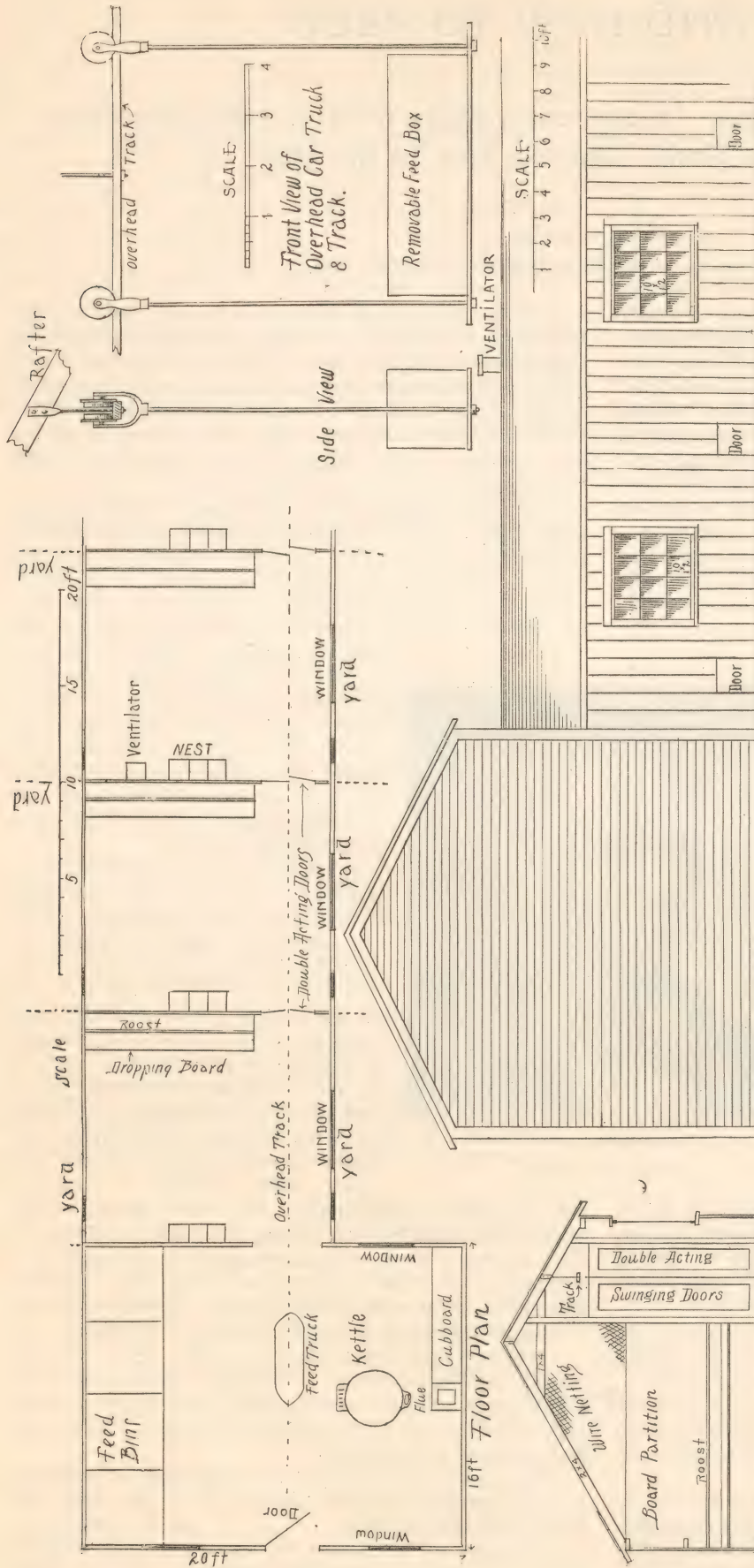
Kindly let us repeat that in setting eggs in incubators, give the machine the same chance you do the hens, and select nothing but the best.

A. F. COOPER.

For plans and description of a laying house, see pages 36 and 37. The house shown and described can be built of any desired length, to accommodate fifty hens or five hundred.



MR. A. F. COOPER.



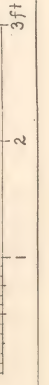
Laying House

DESIGNED BY PRAIRIE STATE INCUBATOR COMPANY
—HOMER CITY PA.

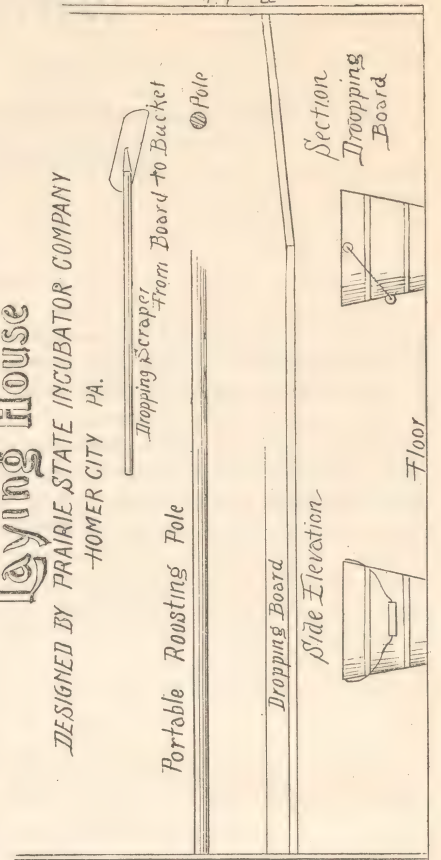
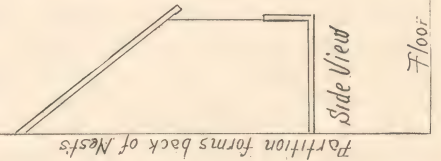
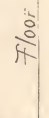
Front Elevation



Front View of Nests



Side View



Section Dropping Board

Floor

3 ft

Floor

Floor

SPECIFICATIONS FOR LAYING HOUSE.

[Furnished by A. F. Cooper, of the Prairie State Incubator Company.]

The foundations of the house for laying hens (see opposite page) may be of posts, stone or brick, or a continuous wall. For sill, 2x6. Plates, 2x4. Rafters, 2x4 inches, 2 feet on center. Walls 1-inch boards battened. This is the cheapest form of construction, but heavier stuff can be used, which is optional with the builder. The row of posts on each side of the swing doors may be made of 2x4. Roofing material is optional with the builder. The floor should be filled in 6 inches higher than the ground outside and constructed of well pounded clay, or cement can be used but that makes it expensive. A good ground floor will answer the purpose, always keeping the floor covered with straw, clover, hay or litter of some kind in the winter months. The doors inside the house between the pens should have double-acting hinges to swing both ways so that the truck can be pushed through, and they will close themselves.

The windows are single sash, containing twelve 10x12 lights. The sashes push sideways to open the windows, and the outside of the window frames should be covered with netting for summer use. The partitions between the pens should be at least 5 feet high, of solid boards to prevent draft through the building, also to keep the chicks from fighting.

The feed truck consists of a plain platform, pointed cow-catcher fashion, so that in pushing the same through the

building it will open the doors. The overhead track consists of a 2x4, suspended every second rafter by ½-inch iron rod. The feed truck can be dispensed with in small houses. We merely illustrate it in order to show its convenience in a long house, from 100 to 300 feet, but in a short ordinary house it is not needed. The plan of the house explains itself pretty fully. The nest boxes, dropping board, roosts, scraper, bucket, etc., explain themselves.

The two-story house at the end of the laying-pens can be dispensed with where the small laying-house is used, and a feed room made of the first pen in the laying-house proper. The rooms at the end of the laying-house can be modified to suit the locality or taste of the builder. It is very convenient. In this part one room is often finished up as an office, the large room being used to contain a feed boiler, feed mills, grinders, cutter, boxes, feed bins, and other articles that are used about the modern laying-house. The second floor is often used as a fodder room to contain clover hay. Clover hay is one of the finest winter foods that can be used.

Occasionally a cellar is put under this part of the laying-house (it is not indicated on the plans) and can be used for the storage of potatoes, turnips, roots or perishable food that is affected by frosts. In cold climates a heater is often put in this cellar or the first floor and a single turn of pipe run through the laying-pens to take the chill off the room. In the south or places of moderate temperature, this would not be advisable. This house has given excellent results and is not costly to build.

A. F. COOPER.

WHAT IT COSTS TO KEEP A HEN.

BY L. E. KEYSER, BREEDER, SAYRE, PA.

WHERE one keeps but a few hens and purchases his feed from the grocer the expense nearly, if not quite, equals the value of the eggs produced. In scientific, systematic and economical feeding lies the profit in the poultry business, whether we are feeding for meat or eggs. To produce a ration that will carry a flock through the year, and at the smallest possible expense, requires considerable study. There are very few who know just what the food consumed by their flock has really cost, or what its nutritive value has been.

A ration for laying hens should contain a considerable variety of grains, grasses and roots to tempt their appetites, and should be rich in egg forming properties, the nutritive ratio being about one to four. This can be produced with cut clover, bran, corn-meal and middlings for a morning mash, and whole grain—corn, wheat, buckwheat and as many more of the grains as can be obtained—for the evening meal, with the addition of raw cut bone twice a week. Beets, carrots and small potatoes cooked and added to the mash will greatly increase its appetizing qualities and somewhat lessen the cost. Beets, carrots and cabbage can also be fed raw to good advantage.

Of such food a large hen will consume about one-fourth of a pound per day, and it should be made sufficiently bulky by the addition of clover and bran to the mash, so that this amount will give her at least two full crops. At the present prices of grain, and allowing that roots cost fifteen cents per bushel, a hen may be kept in confinement on the above ration at a cost of seventy-five cents per year. I have, by careful buying and judicious blending of the food products, kept hens satisfactorily at an average cost of fifty-six cents each per year.

I find buckwheat one of the best whole grain foods for hens. They never become cloyed on it and it is a great egg-

producing grain. In experiments made in feeding during the past winter, where the evening feed had been wholly of corn, I found that the substitution of buckwheat materially increased the egg yield. Kaffir corn is a grain that should receive more attention from poultrymen. While its nutritive value is about the same as that of Indian corn, it is relished much better by fowls and seems to produce more eggs. Where one raises his own grain I prefer to feed both buckwheat and Kaffir corn, unthreshed, as working it out of the straw gives the hens exercise. Millet is highly recommended, and where it can be procured cheaply is an excellent addition to the list of grains. In some sections of the west it is sold as low as thirty cents per bushel. I have only used it in an experimental way for young chicks, it being too high-priced in this section to allow of its extensive use.

I prefer to feed but twice a day, especially during the winter, not only on account of the lessened labor, but because I deem it sufficient. If fed three times a day the hens are apt to wait for their food instead of scratching for it. Where the mash is fed in the morning they usually secure a full crop and then attend to their duties on the nest and in the dust bath until they become hungry, when they will begin work in the scratching-shed, endeavoring to find some of the stray kernels that were left from their last grain feed. Where hens are inclined to be lazy, it is a good plan to feed the mash or soft food at night, letting them work for their breakfast in the morning.

Where fowls are given free range or confined in extra large, grass-grown runs, and one has the land to produce nearly all the food required, it is possible to keep the expense down to thirty cents per annum, and this is the course to be pursued by those who would make a profit on ten-cent eggs, and where hens are rightly managed they can be made to yield a good profit with eggs at this price during the summer season.

L. E. KEYSER.

FERTILE EGGS FOR INCUBATORS.

How To Handle Breeding Stock in Order to Get a Large Percentage of Well Fertilized Eggs for Hatching.

BY E. W. ANDREWS.

Secretary of the E. W. Andrews Co., Elmira, New York, and Inventor of the Universal Incubators and Brooders.

THE breed of fowls kept should depend mainly on the object sought, whether it be eggs or table poultry. Not more than twelve fowls should be kept in one breeding flock. If these are in vigorous health and properly fed, not only will almost every egg prove fertile, but there will be no difficulty in raising the chicks.

To keep a hen in good condition for laying she should never have a full crop during the day. It is not wrong to give a light meal of warm mixed food in the morning. I do not believe in feeding soft, sloppy food, at all. The fowls should go away from the trough unsatisfied and should then seek their food, getting it grain by grain, engaging in healthy exercise in order to obtain it. Feeding soft food leads to many errors on the part of the beginner.

I believe in free range, providing the range is good. During the summer months the hens require less food than in the winter, though it depends somewhat on how they are situated and how many eggs they lay. When on the range they can not fail to secure a full supply of all they require if they are active and industrious. When hens are confined in their winter quarters without range, their morning food should consist of a warm mash made from equal parts of corn meal, wheat bran, and ground oats. If it is customary to mix vegetables in the morning mash these can be used in conjunction with the above mixture. Feed what you think is about half enough in the morning and let them try to find the remaining quantity desired.

Keep them at work. Give clover hay chopped fine and scalded, meat and bone three or four times a week and wheat at night. Keep plenty of grit before your fowls at all times and plenty of clean, fresh water. It is a good plan to change the variety of grain two or three times a week. Do not fail to give fresh ground meat. Follow this plan and you will get fertile eggs.

The majority of poultry raisers begin to set their incubators during the winter months. They fill them with eggs from hens that are confined in small buildings and not properly fed. What are the results? Not twenty-five per cent of the eggs hatch. They continue in this way all winter and condemn the incubator. Toward spring when the weather begins to warm up the fowls are turned out into the runs or given free range. Then they get a change of food in the way of green grass and insects. The hens' combs begin to get red, they are more active and in much better condition and lay more eggs. As soon as a hen begins to get broody, eggs from these thrifty hens are placed under her and the result is a good hatch.

Now, on the other hand, if the breeder had been able to

have his hens sit in the winter when he started his incubators on eggs from hens that were not properly fed and in poor condition, what would have been the result? It would have been no chicks at all. Would he have said the hens were no good, and that they could not hatch chicks? No, he would say it was the fault of the eggs, that they were chilled or not fertile. Readers, if you will give your hens the proper exercise and food in winter, plenty of meat and vegetables to take the place of insects, green grass, etc., that they get when they

have the range in the spring, you will find that a well-made incubator will hatch a larger per cent of strong, healthy chicks than any hen on earth was ever known to do.

The incubator is a necessity on any well conducted poultry plant. The incubator chick is free from vermin, therefore is stronger, and if placed in a first-class brooder made of good material, it will continue to thrive, and a hundred can be raised with less trouble than a dozen under an old hen. The fancier who has a small place in a city or town should give his fowls as much range as possible, but if you are obliged to confine them in small pens and yards, avoid crowding. Be sure to feed animal foods to take the place of insects that the hens get, when they have free range. The poultry raiser on the farm should have a good comfortable laying house for his fowls, and not

allow them to lay the eggs under the barns and other buildings.

All early pullets that will be matured by the time winter sets in should be kept growing, but be very, very careful not to let them get fat. That is a condition a fowl should be in when ready for market; but fat is a detriment to all laying hens. Over-feeding causes more diseases than anything else. If the pullets are not fully feathered when winter comes as well as being in good condition, they will only be a dead expense until spring when almost any kind of a scrub will lay. If you keep common hens commence culling them out as soon as possible and fatten the culls for market, keeping only those you can see are liable to do you good service this winter. Keep only the roosters you wish to breed from, and I would advise you to keep them by themselves until breeding time. Your chicks as well as the winter egg basket will prove to you that you were wise in doing so.

I believe that the Plymouth Rocks and Wyandottes are the best for broilers and roasters. These breeds have received more popular attention than any other. Their merit as the best all purpose fowls goes undisputed, and as an object of beauty they satisfy the taste of all kinds of people. These two well-known breeds are plump, full breasted, with short necks and legs. The flesh is of a superior quality. It has been demonstrated many times that it does not pay to breed scrub poultry. Then why not benefit from others' experience and start right?

E. W. ANDREWS.



MR. E. W. ANDREWS.

INCUBATORS ON THE FARM.

What Can be Done With Incubators and Brooders on the Ordinary Farm and How to do it. A Start Should be Made With One or Two Machines. How to Proceed.

BY G. A. MCFETRIDGE, BOUND BROOK, NEW JERSEY.

Vice-President of the Star Incubator and Brooder Co.

INCUBATORS deserve to be called the farmers' friend as well as the grain drill, harvester and thresher. They are indeed worthy to be classed with the best implements.

It has been fully demonstrated that the incubator hatched chicks are the strongest; it is also an indisputable fact that a greater percentage is obtained from eggs placed in an incubator than from those placed under hens, to say nothing of the endless trouble the hens give. Every farmer, it matters not how busy he may be, can find time to operate at least two or three incubators. All the time required to attend to three machines will not exceed fifteen minutes morning and evening. We will allow that the three machines will hold one thousand eggs all told. Now then we will set the same number of eggs under hens, giving fifteen eggs to each. It will take sixty-seven hens to cover them. The feed for the sixty-seven hens for three weeks will cost \$3.92. Suppose you break the same hens from sitting by putting them into wire coops fastened to the wall of the hen house, without a mouthful of food but plenty of fresh water, for three days. Let them out on the third day just at roosting time or about one hour before, and let them hunt for food the first night. Afterwards feed them with the rest of the flock. It will take three or four days before they get filled and then they will start right to laying and by the time the hatch is due they will have laid one thousand eggs which at two cents each will amount to

\$20.00. Add to this the cost of feed, \$3.92, making a total of \$23.92. So much for cost of feed and lost time while hatching. Repeat this five times, which is about the usual number of hatches run through an incubator in winter and spring, and it will foot up to \$119.60. The above figures are not at all exaggerated. You must let a hen sit at least one week before any eggs are put under her. But if she is taken in hand the first night she sits on the nest she can be broken from her broody spell by the end of one week.

Incubators do not require an expert to run them since the most puzzling part of the operation, the moisture question, is made plain for all time. Since the moisture can be regulated to a certainty in all altitudes and under all conditions of dry and damp quarters, the incubator may take its place among the honest machines which can prove beneficial to the farmer.

A BROODING HOUSE.

I will briefly outline a course for the farmer to pursue. Chicks should be hatched in December, January, February and March for broilers. To accommodate them it will be necessary to have a brooder house. The accompanying cut, Fig.

1, is of a good, cheap house. It should be built with a view to adding a few feet to it from time to time as the business increases.

This house should be fourteen feet wide—nine foot run, two foot brooder and a three foot aisle. The runs should be five feet wide. If you expect to run three incubators the brooder house should be at least forty feet long, thus giving room for eight runs. The heater house can go on the end of the brooder house. The heater pit should be five feet deep. A greater depth would be better rather than less, for the hot water will circulate much better when it has a good rise. The pipe should have at least an elevation of one-eighth inch

to the foot from the heater to the farther end of the system. If only one incubator is used then the best plan is to use a portable sectional brooder with about three sections. Build the brooder house just the same as though you intended putting a heater in, then put the sectional brooder in the place where the pipes should go. Do not crowd little chicks or ducks, if you do death will thin them out until the right number is left. A brooder house must be dry. If the house is built at a time when the ground is wet it will require a long time to get it thoroughly dry.

Figure 1 is a side view of a brooder house showing five sections. To build this house use posts two feet long, set them five feet from center to center, making three rows of them, one row under the front, one under the roof nine feet from the front, and the other row five feet away for the back of the house. This gives you fourteen feet in width, there being nine feet in front of the middle row and five feet back of it. After putting the posts in the ground for the outside of the building (they should go down level with the ground), dig away so a one foot hemlock board will go down even with the tops of the posts. The posts should be set so as to allow two inches for the boards. After the boards are on lay a 2x4 flat on top of the posts even with the outer edge of the board, then use four foot posts in front and six and a half foot in the back. Comb over the center row of posts which rests on the posts in the ground. Divide the runs with one foot hemlock boards and let these boards extend to the alley which is three feet from the rear. Before putting these boards down bore holes for the pipes. Use one and a fourth inch pipes which take one and five-eighth inch holes. Make the holes five inches from center to center, rip the board through the center of holes the width of pipes and after the pipes are down nail the strip in place, which makes a neat job. Get the top of brooder as near the pipes as



MR. G. A. MCFETRIDGE.

possible. The space under the pipes should not be less than eight inches. The holes should be bored one-half inch from the top of the board. Fill under the pipes with sand or coal ashes and

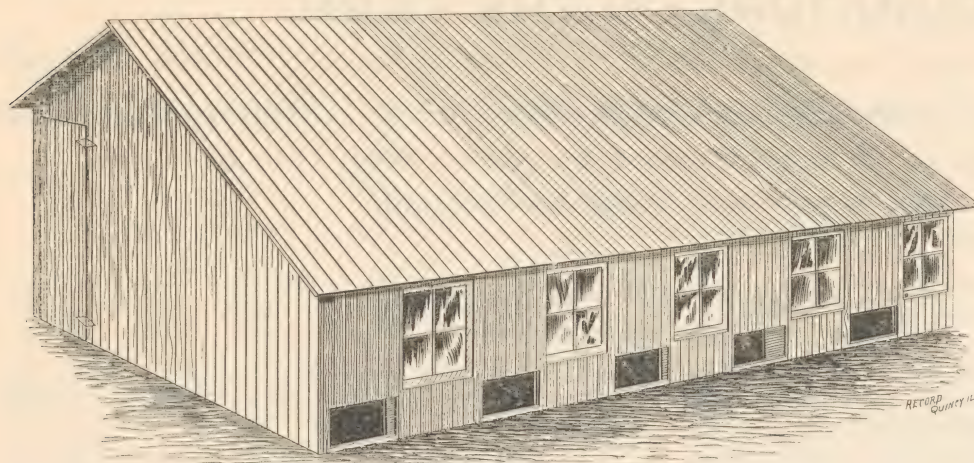


FIG. 1.—BROODER HOUSE RECOMMENDED BY MR. M'FETRIDGE.

before putting the chicks in fill in on top of the ground plainers shavings, hay seeds, chaff or salt hay (any of the above is good), up to within three inches of the pipes which will insure dry and warm brooders.

Hinge half of the brooder top for a lid or door; run wire from the front of the brooder up to a sufficient height and put a small gate in this, leaving the brooder on the alley side.

Put a 5x20 light in the back of each brooder and the chicks will be more contented. Put one window in each run so it will slide on the sill. The sill is raised so that there is a ten inch space between it and the lower sill. This ten inch space is fitted with a sliding door about two feet long, for the little chicks to run in and out as is shown in cut.

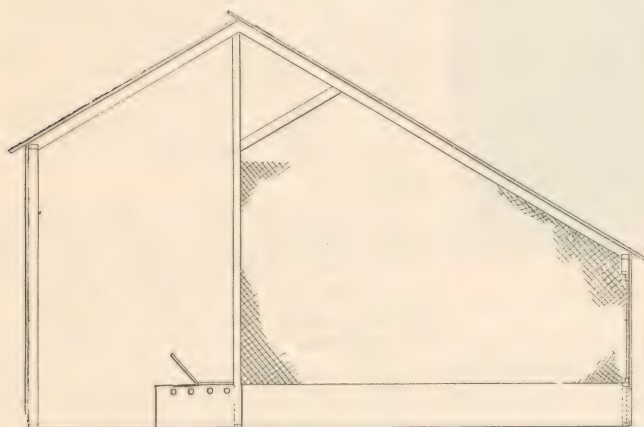


FIG. 2.—SHOWING CROSS SECTION OF BROODER HOUSE AND INTERIOR ARRANGEMENT.

Figure 2 is a cross section of this brooder house and shows the interior arrangement, including the hallway, location of brooder and length of pen.

THOROUGHbred MALE BIRDS.

As a rule farmers have fertile eggs. The only error they commit with the breeding stock is inbreeding. Why not send away and get some male birds of good stock which are off in some point which disqualifies them as far as the Standard goes, but which does not affect their standard as a flesh fowl? Any farmer who will try this method will surely be satisfied with the results. The chicks will be much stronger, the percentage of mortality will be much less and the chick will attain double the size at the end of the first three months, over the inbred stock.

Give your breeding stock all the range you possibly can. An ideal place for hens is a clearing which has from three to ten years growth of timber. Thin out the young growth around the houses sufficiently to let the sun in around the building. When the business is carried on extensively the houses can be built within one hundred feet of each other. Then by the use of a temporary yard the hens can be broken to go to their own houses by keeping them penned in for the first two or three weeks. Then let them out, only for a short time at first until they go back readily, and you will have no more trouble.

A HOUSE FOR LAYING STOCK.

The breeding house shown in cut is designed to hold from fifty to eighty hens. The house should be 14x16 feet. Use six and a half foot posts, comb it in the middle, roof with boards and cover with paper. There can be a pigeon loft in the roof if desired. Figure 3, on the opposite page, shows the front of a house for laying or breeding hens. This house is set up on posts three feet above the ground, or in other words the floor is three feet from the ground, making a basement for the hens. The open side is to the south while the other three sides are boarded up and banked in terrace style to insure dryness. Make a door in floor for the hens to go in and out, and put only two windows in the upper part. This house can be built any length, but fourteen feet is wide enough. Use six and a half foot posts. The perches can go in the back or through the center, but there should be a platform three feet wide and thirty inches high under the perches. Use two pieces of No. 14 hoop iron, bend them as shown in cut, for the perches to lie in. There can be a brace fastened to one end to hold them in place.

Figure 4 shows an anti-egg eating row of darkened nests. This nest box is made by using two one foot boards for the bottom and a one foot board for the sides. Nail the side boards inside of the top and bottom, leaving a space of twenty-two

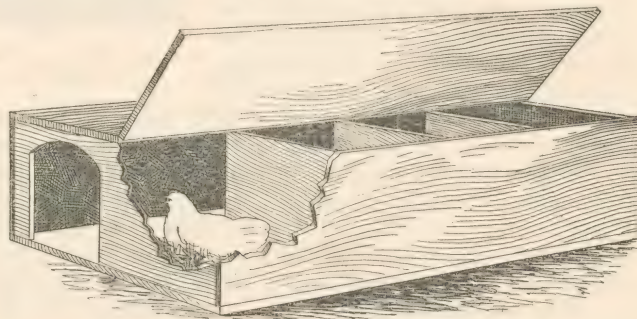


FIG. 4.—NESTS TO PREVENT EGG-EATING.

inches between. Divide the nests with one foot square boards, leaving the nest one foot in the clear. Nail a two inch strip on top and bottom edge of the partitions to hold them in place. The balance of the space is for an alley. These nests serve two good purposes, they stop egg eating and keep the hens out of sight while they are laying.

To get the best results from pullets they should be separated from the males at three months old or even earlier. Just as soon as you can distinguish the sex, put them where they are to be wintered so that they will feel contented, for a

fretting hen will not lay. They must not be frightened. Give them their own way and stay out of the houses during the time they are on the nests. Construct their nests in such a manner that no one can see them while they are laying. Instinct leads them to lay their eggs in a protected place. Hens know that the eggs contain their young, which fact explains why they are so careful of them.

STARTING IN THE BUSINESS.

The question arises with the farmer, "How shall I start in the business?" First, buy a good incubator of one hundred to two hundred egg capacity and become acquainted with every detail. Also get a brooder, and by carefully studying the system you will soon learn how to operate three or four just as easily as you did one at the start. The best place to run an incubator is in the cellar of your house unless you build an incubator cellar similar to the house cellar, where the temperature is not likely to run up during the day as it does in an up-stairs room. Never set an incubator where the sun will shine on it, as that will cause the heat to run up. Never readjust the regulator for at least half a day after attending to the machine, as it will take fully that long to effect a change. When the machine is first set it will require twenty-four hours to get a stationary temperature. The thermostat will open the valve when the thermometers register

not more than eighty-five or ninety degrees, yet you must not interfere with the nut on the connecting rod for twenty-four hours unless the temperature goes above 102. I have seen the damper rise in three or four hours after the eggs were put in when the thermometers registered only 80. This is easily explained, the egg chamber is 102 while the interior of the egg, on which the thermometer rests is only 80 degrees. You cannot be too careful in this respect for so many destroy the germs of the eggs before they even start, with excessive heat.

Keep the heat at about 102 for ten days, after that time it will not injure the eggs to go to 103, but they should not be kept at that degree constantly. Cool them by leaving the doors open a short time morning and evening. Most of these details are given in a book of directions sent with each machine.

After hatching, careful brooding for two weeks is the main point. It has more to do with the chick than even the choicest food. Stale bread soaked in milk and squeezed as dry as possible, is an excellent food. Feed the first time when the chicks are about thirty-six hours old. They should remain in the incubator until they are about twenty-four hours old when they should be taken out and put in a warm brooder for twelve hours more. In the absence of a brooder put them in a flannel

cloth placed in a box or basket near the stove so they can rest and sleep. Little chicks are often killed with kindness at the start.

When little chicks crowd in a brooder they are not warm enough; if they are comfortable they will spread out over the brooder floor; if too warm they will come out of the brooder. Pay attention to these points and you will find it a pleasure to raise poultry artificially.

Do not condemn an incubator until you are positive the fault does not lie with the operator. Subscribe for as many poultry papers as you can find time to read; you will find them of great use. Some poultry papers are better than others.

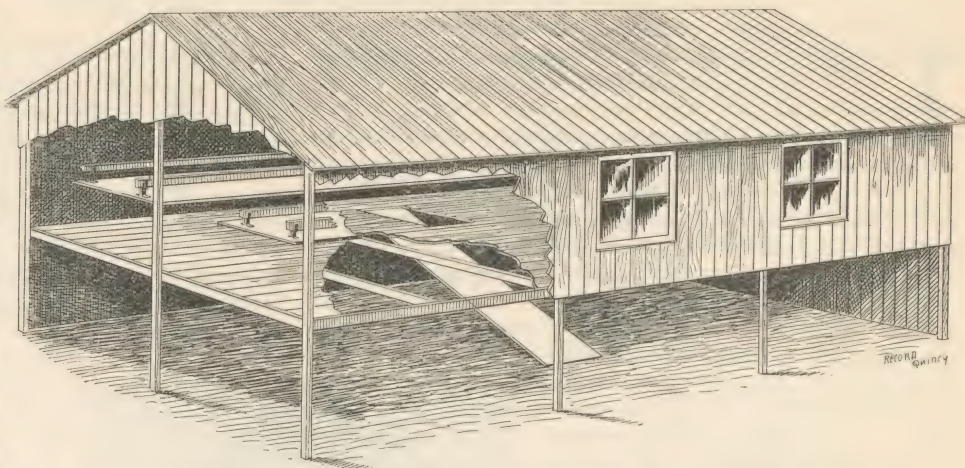


FIG. 3.—BREEDING HOUSE RECOMMENDED BY MR M'FETRIDGE.

I am well aware of the fact that farmers allow their hens to roost in the wagon house, stables, pig pens, and so on. To all such I will say, do not try to move them into a modern house after the first of October for the change will surely give them the roup which will knock you out for the rest of the season. To make sure of winter eggs it is necessary to do all of the shifting in July. Hens will lay when they are contented, and fretting will certainly stop the formation of eggs just as much as cold weather will. Should you start into the business this fall, do not change your hens from their present quarters but make the best of it until another season.

Use lice exterminator and make sure that they are all driven off the fowls and roost. Hens kept for laying market eggs should not have any male birds with them, as infertile eggs will keep much longer than fertile eggs. Do not crowd fifty hens into a house large enough for twelve.

The white and buff fowls dress and sell better than black fowls as they do not show the pin feathers so much. For broilers I like Leghorn males and Plymouth Rock females. The Leghorns mature quickly and their flesh is excellent. I would not advise breeding from the cross, but use the pure-bred birds for each year's matings. G. A. MCFETRIDGE.



BREEDING STOCK--INCUBATING--CHICKS.

Care of Breeding Stock to Obtain Fertile Eggs—The Incubator is Not a Mystery, But a Practical Success—How to Brood the Chicks—What to Feed.

BY E. O. ROESSLE.

Editor Poultry Department *Country Gentleman*, Albany, N. Y.

THE modern and up-to-date methods of raising chickens so far surpass the old fashioned ideas that we can safely say that they have become a science. This term seems to fit poultry culture to a nicety, because science is really knowledge reduced to system. First we must have the knowledge and then reduce it to a system. Haphazard chicken raising is a thing of the past and with the progress going on in this particular branch of farming at the present day I hope it will never lapse again into any method where chance will form any part of it.

To obtain the knowledge necessary to successfully carry on a poultry plant requires an apprenticeship which is gained by some years of hard study of the subject, not from books alone, as in most sciences, but from practical work based on one's own experience.

What has brought the mind of the average poultryman (who, by the way, was originally a plain farmer), to make poultry culture a science, is undoubtedly the introduction of the modern improved incubator. I assert, without fear of contradiction, that artificial hatching has done more to improve poultry and to increase the industry to its present proportions than any other one thing. The incubator has brought us in intimate relations, first, with the germ in the egg. Before the introduction of the simple little testing lamps, the germ in the egg was something never thought of. If we stop to reflect on the early days of our youth on the farm, we remember that all we knew of hatching eggs was the very primitive fact that "mother" put thirteen eggs under the hen and the chickens came out in due time. We knew nothing of the why or the wherefore of the process. It was very much like the kodak, "You press the button, we do the rest."

The result of this primitive process of feeding and raising chickens was the survival of the fittest. But primitive though it may have been, it has laid the foundation for many sound teachings in modern poultry culture. It has proved one thing beyond a doubt, and that is that newly-hatched chicks are not delicate because of their age and size, but on the contrary are quite strong and hardy; and it is only a lack of knowledge of this fact which causes the inexperienced amateur of to-day to coddle them, so that their lives are prematurely shortened and few grow up to become fowls.

The American mind is not, as a usual thing, satisfied to accept things blindly. We are too inquisitive to let matters rest without knowing the inside of them. Some, even to-day, may ask how much better off are we now for knowing anything about the germ in the eggs. If we have received no

other advantage we have been able to determine the vigor and health of our breeding stock from testing an egg. This one point is the forerunner of successful incubation, whether it be done naturally or artificially.

It may sound absurd to breeders, but I will venture to say that nine men out of ten one meets on the street are ignorant that it requires a rooster mated to hens to produce fertile eggs. In other words the prevailing opinion seems to be that any egg will hatch. We have learned from artificial incubation what a mistake this is. Every egg will not hatch and it may as well be understood

at the beginning that only those eggs which come from good, sound, strong stock, carefully mated, will hatch at all, and that the stronger the original stock the stronger and healthier will be the chickens.

THE BREEDING STOCK.

To keep breeding stock in the condition to produce hatchable eggs requires good common sense and good care. In the first place the stock must above all things be healthy. Stock out of condition when mated, or allowed to become so later, will not lay many eggs, and even these will show a small percentage of fertile ones. To keep stock healthy depends entirely upon the care and feeding. It is my opinion that the average breeder feeds too much. The result of this is overfat stock and poor eggs. Fat hens will not lay fertile eggs, and over-fat roosters are not vigorous.

Good judgment in feeding is based on a study of nature. For example, a hen's instinct is to hunt for her food. If we wish to follow nature, therefore, we must endeavor to assist this instinct. If we feed a morning mash we must feed only enough to tone up the system after a night's fast and allow the instinct of hunting for more to prevail in the hen. If the flock is cooped in winter, by scattering grain in deep litter in pen or scratching shed we give them something to find when hunting, which simply encourages them to hunt for more. If the flock is yarded in spring and summer we must scatter grain so widely in the runs that the hunting process still continues, induced as before mentioned by a short morning feed. At night a liberal feed, entirely of grain, is necessary, governed as to quantity by what each flock will eat up clean. This liberal feeding at night fills the crop and helps to keep the fowls comfortable and contented till morning, and it has a great deal to do with the production of the next day's eggs.

Variety in food must not be overlooked. Here again instinct must be followed. The hen that roams at large helps herself to every variety of food which she can possibly find. And yet with all the care and judgment in feeding, if we



MR. E. O. ROESSLE.

forget to induce exercise we will ruin our chances and the fertility of our eggs will be as small as ever.

THE IDEAL MATING.

The busy female and the gallant male make the ideal breeding pair. The former will be a hustler for food from morning to night with an occasional rest for pluming and dusting, and the latter will be almost constantly attractive to his mate, scratching, calling and offering tempting morsels. Such a combination can not fail to produce fertile eggs.

A tendency exists among our more advanced breeders of the present day towards small matings. This has come about from experience and has in many cases increased decidedly the percentage of fertility. The old method of allowing any number of males to run at large with any number of females had but one advantage, it tended to small matings; in other words, there were always enough males. A well mated pen should never contain more females than the male bird can do full justice to. The exact number can be decided on according to the breeds. Whereas eight or ten females are sufficient for one male in Plymouth Rocks, a White or Brown Leghorn could do equal justice to a dozen or fifteen females. Extremely small matings, such as trios, I consider have their disadvantages, principally in a waste of vigor in the male bird.

The age of breeding stock frequently controls fertility. Old hens, unless they are very exceptional, are poor breeders. They are inclined to fat and become lazy by nature. If I were selecting an ideal pen, I should confine yearling hens with cockerels, or fully developed pullets with very vigorous yearling males. My remarks are nothing new probably to breeders of experience; in fact, we all who are at all successful have learned the secrets of strong fertility, but can our farmer friends be induced to take a lesson and profit by what the advanced breeders are doing?

HATCHING WITH AN INCUBATOR.

The science of poultry culture need not frighten our brother who has never considered raising chickens any great thing to do. I grant that the old way, with a sitting hen, has always proved good enough for him, but when, as at present, the opportunity is at hand to make dollars where he made dimes before, it would seem that he should take advantage of it.

The farmers' wife is the best person on the farm to run an incubator. In the first place she stays more at home than the farmer, and is more particular about the details of the house. Secondly, she is decidedly more patient, careful and persevering. These qualities fit her nicely for incubator work. I know well that the first objection to this loading more on the usually overworked housewife of the average farm will be that she has too much to do now without bothering with any such nonsense. Running an incubator on a farm is not the bugbear one imagines, and it is not nonsense. It is a very simple operation and will return to the farmers' wife a good profit on the time and work she devotes to it.

On an up-to-date poultry plant an incubator cellar is a requisite, just as much as an incubator. A cellar is the very best place to set up a machine, because, above all things, the variations of temperature are slight and it is usually dry. There have been hundreds of failures in artificial incubation on farms, from the very fact that the machines have been placed in barns, sheds, or any old building above ground, where a space could be found. The result of this has been so great a degree of fluctuation in the temperature (eighty or ninety at noon and forty or fifty at night), that no machine made could help being affected by it. The first principle of hatching an egg is uniformity of heat. This should be known by any farmer's wife and certainly is not mystical or scientific. She knows it when she sets her hen, and she takes pains to see that "Biddy" sticks to her nest.

I really believe that the objection to incubators on farms, as a usual thing, is based on a certain mystery supposed to be connected with them. When questions such as "How long does it take to hatch chickens in that box?" are asked, it seems to prove my theory of mystery. The average farmer seems to forget that the incubator, although artificial is still a copy of the natural process of incubation by the hen. Nearly every farm, whether it be run on plain or scientific principles, has a cellar. Potatoes, apples, roots, turnips, pumpkins and a variety of other things to be kept over winter must be put in a cellar, and such cellars must be dry. Every farmers' home even has a cellar, and this is also usually dry. Now we must find a space for at least one hatching machine in this cellar. Of course the house cellar will be the most convenient for the farmer's wife, especially in bad weather when she might have to tramp out to the potato cellar to fill the lamps or turn the eggs.

RUNNING AN INCUBATOR.

We have found the place for an incubator, now let us explain the machine. In the first place, it is not a bother to run one, nor is it at all difficult. The farmers' wife may go to bed just the same; she need not sit up with the machine. It will keep on all night attending to business, and she will visit it in the morning and find it all right. When the machine arrives from the factory it must be set up. It will be nicely packed and all its "fixings" will be found inside, securely fastened. Fit these by the book of instructions to their places and then take a spirit-level and be sure the machine is level on all four sides. Next fill the lamp and place it lighted on the stand, where it belongs. Having placed the thermometer inside on the tray, watch it and see the mercury rise until it reaches 100 degrees. It will be noticed that a little delicately adjusted disc on top is open above the lamp chimney. This is the regulator for the heat and must be kept closed until the thermometer registers 100 degrees. Then if it lifts a little and rests so, the mercury will remain where it is. When this much has been done, let the machine alone until morning and then see what the thermometer says. If it is still found to register 100 degrees, the object is accomplished. Now is this difficult? Is there anything terribly scientific about it? And yet you have succeeded in regulating that very mysterious invention, a hatching machine. By regulating I mean you can be satisfied that you know how to control the heat inside the machine. This is more than half the battle.

The eggs may now be introduced and after they have been in long enough so that the mercury in the thermometer has returned to its original mark, it will be found to still go a little higher and rest at 102 degrees, which is correct. These additional two degrees are caused by the eggs placed in the tray which brings the bulb of the thermometer at least an inch nearer the source of heat, which is at the top of the egg chamber.

The daily care of a hatch consists in turning the eggs twice a day, morning and night, and filling and trimming the lamp. This very easy task continues for seven days. On the seventh day the testing takes place. This is quite simple and is done by passing each egg in front of the testing lamp (which is provided with the machine) and discovering the germ. This germ consists of a black spot with spider-like legs radiating from it. The stronger this appears the stronger will be the chicken. Eggs which are clear and contain no spot are infertile or dead and should be thrown out. They will never hatch. After the test there will be fewer eggs left in the machine, but each egg will contain a possible chicken. As this means life each egg will radiate more heat itself. This will necessitate a readjusting of the regulator and 103 degrees of heat will be found better than 102 degrees as before. This 103 degrees should now be continued constantly day and night until the chicks are hatched.

The guide which is most reliable in determining the

progress of the hatch is the development of the air cell. This is a little space in the large end of the egg which is visible at testing time and should continue to grow larger and larger until about the nineteenth or twentieth day, when it occupies about one-fifth of the entire egg. Unless this air cell is developed correctly by the twentieth day the chick cannot turn itself in the shell, hence sticks and dies although it may be fully developed. The development of this air cell is the vital point to be considered in obtaining a first-class hatch. It is controlled in two ways. If it develops slowly, which is usually the case, give the machine and eggs all the air you can. This can be done by opening the slides over the ventilators full width and cooling the eggs as long as possible each day. The cooling process is best accomplished by placing the trays of eggs on top of the machine (closing the doors meanwhile), and leaving them there until the thermometer drops to 80 degrees, not lower. As the hatch progresses the eggs will stand more and more cooling.

If the air cell develops too rapidly it can be checked by almost closing the slides (but never close entirely) and introducing a very little hot water in the moisture pans. This checking development is rarely necessary as almost any cellar contains a sufficient amount of natural moisture to check a too rapid development. Hence the moisture question is one hardly to be considered except in extreme cases. The chances are that the difficulty will be in enlarging the air cell sufficiently. When the chicks begin to pip the shell keep the doors of the machine closed until the last chick is hatched. Close the ventilating slides almost entirely and keep the thermometer up to 103 degrees full.

This is a brief description of hatching chickens artificially, and I have tried to make it as clear as possible. When the last chick is hatched keep all the chicks in the machine thirty-six hours before placing them in the brooder. This I consider one of the most important points in raising strong chickens. It gives them a good chance to digest the yolk of the egg which is their natural first meal, and broods them sufficiently after leaving the shell, to make them strong on their legs. Chickens which are strong when introduced into the brooder usually live; the weak ones die.

BROODING CHICKS ARTIFICIALLY.

With a hatching machine you must have a brooder. Every first-class hatcher has a brooder suitable for the machine. Brooding chickens successfully is in my opinion a difficult task. This is true particularly because the correct principles are not understood. A brooder whether indoor or out, should be capable of radiating heat uniformly. Chickens require a hover or heat section where they can find the heat when they feel chilly. They do not do well in any brooder which is half heated or all heated. The hover alone should contain the heat and the rest of the brooder be cold. This is especially true of indoor brooders. The cool place of an out-door brooder should be outdoors itself. Cuddled chicks or those that live in an atmosphere poisoned by heat, sicken and die. The hen is the hover or heat and all the rest of this natural brooder is cool or cold, in fact is outdoors itself.

The feeding of young chicks bothers many persons and causes a large percentage of mortality. For two or three days a good food is, first day, rolled oats every two hours or when the chicks appear hungry. Then for two days use any first-class chick meal. To this mash should be added a liberal handful of chick size grit and well mixed in it. This will be the greatest aid to digestion and will prevent in a great degree, if not entirely, bowel trouble, the most prevalent ailment of artificially brooded chicks. After two days whole wheat and small sized or sifted cracked corn may be given two or three times daily, after feeding the morning mash. Green food also, in the shape of small cabbage, may be given every day after the third day.

Water should be kept by them constantly from the minute they are placed in the brooder. It should be clean and kept so, and at the temperature of the house and not of the hover.

The heat in the hover should be reduced as rapidly as possible after the first week, the degree of heat to be determined by the chicks themselves. If they crowd at night they need more heat; if they sleep well separated they are all right. Too much heat for too long a time will do them as much harm as overfeeding. As chicks start out in life, strong, robust and active, we must try to keep them so and make them as hardy as possible.

Exercise is absolutely necessary in order to raise healthy chickens. They can not exercise too much, in fact they should be kept busy from morning until night. They will seek the hover when they feel the need of heat, and will or should continue to scratch the rest of the time. Always give them something to scratch for. Scatter small grain in deep litter indoors, or scatter it in their outdoor runs. If they hunt and scratch and find something they will be encouraged to hunt again.

The worst ailment which we must fight is what is known as bowel trouble. Over-feeding and bowel trouble will reduce the percentage of your brooder chicks so alarmingly that the bravest and most enthusiastic amateur will give up the artificial method, utterly discouraged. Bowel trouble comes from indigestion and is easily controlled and cured by mixing plenty of grit in the soft mash or food other than grain. Mixed in the food the chicks are compelled to eat it, and thus the proper substance is supplied to their small gizzards, which virtually grind up the food.

Fresh air never killed any chicken. Therefore give them access to it freely, provided they have learned the way back to the hover. To sum up and make the brooding question short, follow as nearly as possible the actions of the hen when she cares for her brood and you will raise strong chickens artificially.

A warm, not hot hover, and a cool house.

Feed only when the chicks are hungry and thus never overfeed.

Put plenty of grit in the food, compelling them to eat all together, thus insuring good digestion.

Keep them exercising and give them plenty of fresh air. By following these few rules your chickens can not help being healthy.

CONCLUSION.

What advantages are gained by raising chickens artificially, is a question frequently asked by those who have never tried the experiment. Artificially hatched chickens are just as strong as those hatched by natural process. The percentage is larger with the machine. The trouble is slightly more and the anxiety decidedly less. From two to five hundred chickens can be hatched with very little expense and very little trouble. The machine is always ready for business and one does not have to wait for a broody hen; hence chickens can be hatched far earlier. It all depends upon the percentage of fertility of the eggs. Fertile eggs are absolutely necessary to insure a large percentage of chicks at any time of the year. Incubated chickens do not have lice, gapes and many other kindred ailments. Brooding can be successfully accomplished if the suggestions I have made are carefully followed. An incubator will be found a very valuable acquisition to any farm, and many of them to-day have paid off old and troublesome mortgages.

Where there is room for one machine in the regular potato or root cellar of any farm, space can easily be had for more machines. As one machine makes a return which will, without doubt, be satisfactory, another can be added until a fine poultry plant is established. It is a poor machine which, if properly run, cannot pay for itself in one season. Where there is one chicken hatched to-day by the hen there are hundreds of them hatched by machines.

With the great boom in chicken raising by artificial means sweeping all over the country, it is time that our farmers realized that the old-fashioned method is played out and that the modern incubator and brooder are the successors of Mother Hen.

E. O. ROESSLE.

NATURE AS OUR TEACHER.

BY FRANK FOY.

Superintendent Hatching and Experimental Department of the Des Moines Incubator Company, Des Moines, Iowa.

TO succeed in getting the best results from an incubator, we find it most important to apply nature's methods as nearly as possible. This is best done by noting the habits of the hen when allowed entire liberty, that being the class of sitters which, invariably, bring off the largest hatches. The little miserly brood usually comes from the hen watched over by the careful attendant. How many of us have counted our chicks before they were hatched, simply because the hens sat so faithfully, we often being obliged to remove them from the nests to prevent starvation? And how many have been disappointed because no chicks appeared only in a fully developed state "dead in the shell." It is the persistent sitter, and the too constant application of heat, that cause these failures, and it is just such facts that are so necessary to keep in mind when running our incubator.

With the hen, instinct creates a change in her mode of sitting. During the spring months she will lose as little time as possible in taking her daily vacation, and often returns to her nest without the usual dust-bath. Set this hen in May or June and she will leave her eggs from forty minutes to an hour, and during the warmer period the time is considerably increased, and she often leaves the nest twice a day. When the weather is ranging at a high temperature you will frequently observe the good sitter standing on her nest, especially when the animal heat is greatest within the egg, from the fourteenth to the eighteenth day. It is within that time that so many chicks are smothered.

Location is wholly immaterial. It may be under the barn, hay-stack, mulberry bush, hedge fence or in the hay-loft, where moisture is unknown. Healthy chicks, and lots of them, are hatched in all such places. Should the hen find it necessary to go through wet grass, in going and coming from her nest, do not believe that it is done intentionally. The old hen knows that she has laid eggs that are supplied with enough moisture. She also knows the amount of heat and air that are required to hatch them.

THE INCUBATOR.

The greatest number of failures reported to us come from those who have had no difficulty in keeping an even temperature throughout the hatch. To show the incorrectness of that theory, I will relate my experience with an incubator which had previously been operated with unsatisfactory results. In August, 1897, we completed a hatch by exposing the eggs to the open air for one and a half hours daily, commencing on the third and including the nineteenth day. With that amount of exposure the eggs became quite cool and frequently required six or eight hours to bring them up to 103. In this experiment twenty out of twenty-four fertile eggs hatched vigorous chickens.

It was inferred that gradual heat applied to the eggs was as essential as the process of cooling, therefore a second experiment was made. Twenty-six eggs were placed in the same incubator and exposed to the air as in the preceding case. Sufficient lamp flame was turned on to warm them up to 103 in one or two hours. The result was: Six chicks

hatched, six pipped the shell, and nine died apparently on the eighteenth day. On many different occasions we have found that eggs which are leisurely cooled and warmed hatch much better than those kept at a regular temperature.

MOISTURE.

The most difficult problem that the novice has to contend with is moisture. The average book of incubator directions prescribes using moisture at certain times and under certain conditions, and every time the inexperienced operator visits his incubator, which is at least a dozen times a day, he imagines there is a new condition and the developing chick suffers another application of water in some form. Better your chances by ignoring moisture altogether, though a little, just at the last period of the hatch is often a benefit. For general management of your machine, the best I have to offer is as follows:

Place it where the temperature is least affected by outside changes. First make sure that it stands level and run it one or two days before putting in eggs, or at least until you have learned the action of the regulator and can maintain an even heat in the egg-chamber. If your incubator has two trays, put a thermometer on each with top of bulbs on a level with top of eggs. Keep in mind the importance of having the two instruments resting against fertile eggs after the tenth day. Should there be a difference of more than one degree on either tray, raise the machine at coldest end about one-fourth

of an inch. In such cases, the incubator with a tray adjuster, serves a good purpose. The radiation of heat throughout the egg-chamber may be ever so equal when the hatch is started but when life within the egg begins to develop the highest temperature is found where the most and strongest fertile eggs lie, and with the tray adjuster it is easily equalized.

Carry the heat at about 102 during the first week; 103 is about correct for the last two weeks. A temperature of 104 or 105 while hatching will do no harm providing the bulb of the thermometer rests on a live egg, otherwise the temperature of the eggs containing live chicks would be two or three degrees higher than the thermometer indicated.

Turn the eggs twice daily commencing on the evening of the second day. Make the last turn when you note the first eggs pipped. Begin cooling on the fourth day. Cool a little each morning, gradually increasing the time as the hatch proceeds. If the machine is full of live eggs, the heat will have a tendency to run up during the last week. Through this period I have had best results by opening the doors, pulling the trays partly out and leaving them there until eggs cooled down four or five degrees; sometimes this would require a half hour or more. In winter and spring this is not necessary, but it certainly improves a hatch during the warmer seasons.

Though not as serious, the question of proper ventilation is almost as confusing to the beginner as the moisture problem. A little ventilation is a good thing, though the amount depends somewhat on the location of the machine. If the incubator is being operated in a room above ground, a very small quantity is needed and we would not advise keeping the ventilators (such as used on the Successful) more than one-fourth open. If it be in a cellar, keep about one-third open.

Too much ventilation weakens the embryo chick, causing the membrane of the egg to become tough, and it hardens the shell. These conditions will go a long way towards reducing the per cent of your hatches.

FRANK FOY.

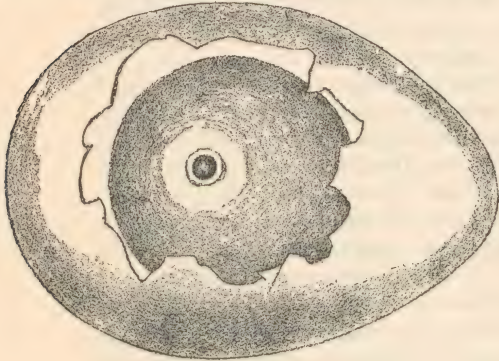


MR. FRANK FOY.

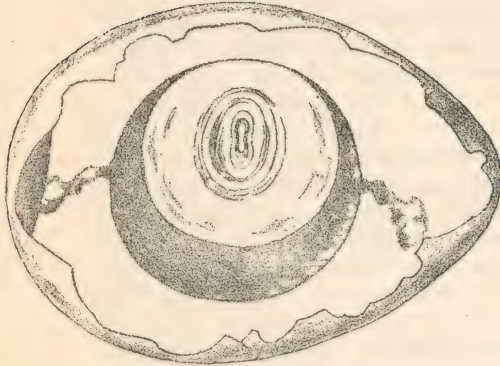
DEVELOPMENT OF THE CHICK.

The illustrations on this page (which were kindly loaned us by the Des Moines Incubator Company, Des Moines, Iowa,) show the development of the chick within the egg during the different periods of incubation. These interesting illustrations are owned and copyrighted by the Des Moines Company.

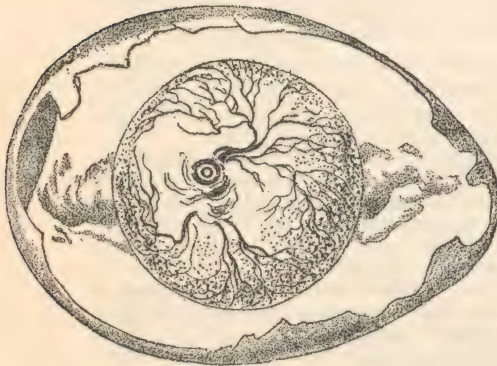
AFTER 13 HOURS OF INCUBATION.



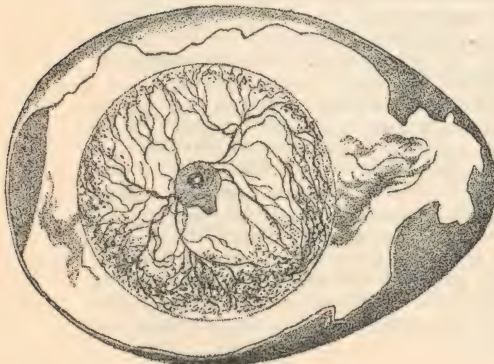
2ND DAY



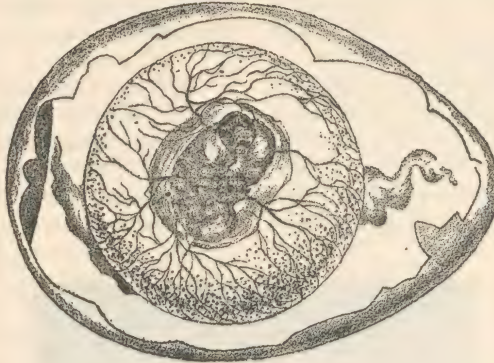
4TH DAY



5TH DAY



6th DAY.



9th DAY.



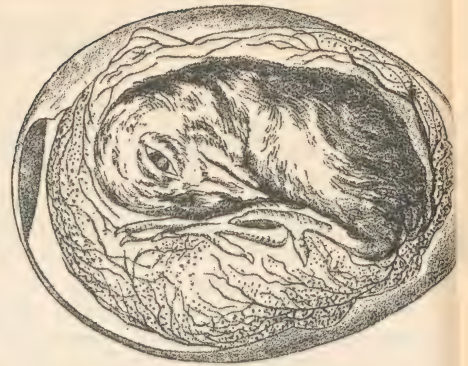
11TH DAY



12th DAY,



15TH DAY



18th DAY.



20TH DAY.



21st DAY.



THE INCUBATOR IN OPERATION.

Getting the Machine in Working Order—Where Best to Locate an Incubator—Location of the Thermometer—Care of an Incubator In Operation.

BY JOHN W. MYERS, PRESIDENT OF THE RELIABLE INCUBATOR AND BROODER CO., QUINCY, ILL.

IF the incubator you are about to begin work with is one you used last year it will need to be cleaned out, overhauled and put in perfect working order. It ought to have been thoroughly cleaned out when you put it away last summer, but if this was neglected then, do it now. For washing out the egg chamber, egg tray and turning rack, if they were left in a soiled condition or are musty, use hot water into which a liberal amount of baking soda has been mixed. Cleanse and air the egg chamber, tray and rack until they are sweet-smelling.

Next test the regulator. Do this by filling the lamp, lighting it and running the machine two or three days to make sure that everything is in perfect working order. If there should appear to be something wrong with the working of the regulator do not trust your own mechanical knowledge to fix it, unless it be some simple matter, but write to the manufacturers, asking them for instructions. Remember, please, that the men who made your machine are really in a position to know more about it than can a person who has simply operated it one or two seasons. It is true that the best of machines have to be run differently under varying conditions, and sometimes the manufacturers' directions have to be departed from in order to obtain the best results, but, nevertheless, in a large majority of cases it is best to follow the directions of the manufacturer of the machine and any departing from these directions should be done cautiously and only after due deliberation, unless you have "eggs to burn."

Quite often purchasers of incubators report that their first hatch was the best one they ever had. No doubt in a majority of cases this was because they followed closely during their first hatch the directions sent with the machine. Later on they get to thinking that they can improve on the manufacturers' method of operating the machine, and hence gradually depart from their instructions—the results, as a rule, being worse rather than better.

We have known of cases where buyers of incubators wrote to incubator companies, abusing the members thereof for not sending them proper instructions for operating the incubators, when the book of instructions covered explicitly the points complained of. We remember a case of one man's writing to this effect: "Mr. ——— called yesterday and told me I must turn the eggs every day after the third day. Your book of directions says that the eggs are to be turned once a day after the fourteenth day. Now because your book is wrong, I have lost two hatches of about 400 eggs. I believe you ought to send me at least 200 thoroughbred Plymouth Rock eggs to make up for this loss."

This man was asked to again read that part of his book of directions which referred to the turning of the eggs, and, if he did so, he found that he was there explicitly instructed to turn the eggs twice a day, morning and evening, beginning with the third day. Evidently he had overlooked this, or had not looked at his book of directions for so long that he had forgotten that such instructions were given. This is an

extreme case, no doubt, but there are many other cases that approach it. We urge, therefore, that in every case you follow the instructions that come with the incubator until you are morally certain that they *must* be departed from in some particular in order to get satisfactory results.

If we were a new hand with incubators and had bought a standard machine from some responsible company, we would impose on them just far enough to describe to them as near as we knew how, just what conditions existed in the room, cellar, cave or other place where we had our machine located, and would ask them to be kind enough to advise us whether or not their regular instructions should be departed from in our case, in order to get the best results obtainable. Any incubator company in good standing which has a proper regard for its reputation and future business success, will do this, and do it rightly. If the incubator company you patronize, or have patronized will not do this, the next best thing, perhaps, is to write to the editor of your favorite poultry paper and ask him to advise you. Make your statement of facts as plain and condensed as possible, and if you feel that you are imposing on said editor, send him a couple of new subscribers, or a renewal of your own subscription, and if this does not sweeten his disposition and secure his good offices, he ought to be in some other business.

WHERE TO LOCATE AN INCUBATOR.

This question arises with every person who proposes to operate an incubator, "Where is it best for me to locate my machine?" As a rule, taking incubators as they are, a good, dry, well-ventilated cellar is the best place. The air in this cellar should be pure and should be renewed either daily or every other day during the progress of the hatches. Every incubator must supply sufficient fresh air to maintain life in the egg, and this air must be pure if the chick is to come forth strong and healthy. Experts have made tests that proved that the embryo chick must have fresh air almost from the first, and the supply must be kept up until the chick emerges from the shell. Where eggs in these tests were coated with shellac or varnish, not a chick came forth, proving beyond question the necessity of fresh, vitalizing air. A damp, mouldy, foul-smelling cellar is not a fit place for artificial incubation; in fact, it is about as bad a place as one could select. It is a mistake to operate an incubator in an atmosphere that is unfit in any way for human beings to breathe.

A cave that is properly ventilated is also a good place. The main advantage in using a cellar or cave is, that the temperature therein is far more uniform than is the rule in a dwelling house or out-house of any kind. Some incubators can stand quite extreme changes of weather, while others can not. It is better to be on the safe side rather than to depend on the construction of the machine and the regulator to withstand these sudden changes in the weather, where the thermometer may fall 40 degrees within twenty-four or forty-eight hours, as it sometimes does in this latitude.

It has been our experience that where a room in a dwell-

ing house is to be used as the location of an incubator, it is better to select a room in which there is no fire during the day, rather than use one of the living rooms where the temperature is seventy degrees during the day, while the fire is burning, and may go down below the freezing point during the night when the fire is low, or has gone out entirely. In such cases you have, every twenty-four hours, a great change in the temperature of the air surrounding the incubator, and the regulator is put to a severe test. The warm side of a room that is not heated in this manner, or the warm end of a hallway is a better place, in our opinion, than a living room such as is referred to. Where a house is heated by steam or a furnace, or one or more rooms are heated by a base-burner in which a good fire is kept all night, thus keeping the temperature reasonably uniform during day and night, it should be an easy matter to find a satisfactory corner for the incubator. The object is to find a location for the machine where the changes in the temperature of the air surrounding the incubator will be as slight as possible under the circumstances.

No matter what make of machine you have, and no matter where you locate it, it is necessary that you make a study of the machine and of the processes of artificial incubation in order to succeed well—in fact, it is necessary that you should master the subject (and it is not an intricate one) provided you are to obtain the best results possible under given conditions. Hatching with incubators is not a difficult matter where the few essentials are understood, but if these essentials *are not* mastered, a person is liable to soon come to look upon artificial incubation as an intricate and vexatious problem.

THE QUESTION OF HATCHABLE EGGS.

Now that you have your machine located and everything in good working order, the question of suitable eggs presents itself. Here is one of the important matters to be looked after with great care. We know one man who sent to the corner grocery store and bought 218 eggs from which he hatched 203 chicks, but where this was done in one case, we have heard of dozens of other cases where store eggs did not hatch even three chickens out of 200. It will not do to depend on the store keeper for eggs to hatch. To have to depend on near-by farmers is bad enough, for they are careless in gathering them, allowing them to get chilled. The person who is in a position to get his eggs for hatching from his own hens, gathering them and caring for them himself, is in a position to *know* what he is doing. At best it is a hard matter to get satisfactory hatches during December, January and February, for the reason that these months are outside of nature's hatching season, and nature has a way of doing things in her own time, to best advantage. This is not saying that nature cannot be improved on in many cases, or that she cannot be turned from her course and made to serve the interests of mankind, but the fact is, that people who take up artificial hatching and brooding during the three months named have nature to contend against and they will find that she must be studied and courted at every turn. It is a comparatively easy matter to hatch chicks and rear them by artificial means during March, April, May and June, bringing off large hatches and raising a good percentage of the chicks, but in mid-winter the same task calls for greater care and more intelligent management.

Eggs laid during freezing weather, that are to be incubated, should be gathered while they are still warm, or at least before they have a chance to chill, and care should be taken that they do not chill. A good plan is to have a basketful of bran or oats that is kept in a warm room. Take this to the hen-house or barn when you gather the eggs, place the fresh laid eggs in the bran or oats, which will protect them from the severe cold while being carried to the house and until ready for placing in the incubator. Eggs intended for hatching should not be kept in a temperature that goes below

40 degrees, and we would prefer to have these eggs kept in a temperature ranging from 50 to 70 degrees.

When you come to select your eggs for hatching, reject all that have thin shells, rough shells, or that are badly misshapen. The extra large eggs containing double yolks should be rejected and the extra small eggs. Medium small eggs will hatch just as strong chicks as medium large eggs. We have proved this time and again. It saves time and money value to examine the eggs through an egg-tester before placing them in the machine at all. Among winter laid eggs, in fact, those laid during any season of the year, you will find a considerable number with mottled shells. These eggs seldom hatch. In testing during the seventh or tenth day, we have rejected hundreds of these eggs, and it is the rare exception that one of them is found to contain a chick embryo, hence it is best to reject them in the first place.

You can buy a good egg-tester in the shape of a tin lamp chimney, with an arrangement on one side to hold the egg for testing, price fifty cents. They are for sale by incubator companies and poultry supply dealers. Do your testing in a pitch-dark room. Have the eggs fit as snugly in the oval place in the tin chimney as possible, so that all the light will be confined to the chimney. This will enable you to see clearly whether or not the egg-shell is mottled. By "mottled" is meant a shell that is spotted on account of being uneven in thickness, some places thin and others thicker. Such an egg-shell is too thin and porous.

A MATTER OF GREAT IMPORTANCE.

We next call special attention to the importance of the exact location of the bulb of the thermometer you use. In some machines that we have tested a difference of a *quarter of an inch* in the distance from the bulb of the thermometer to the bottom of the hot water tank or hot-air reservoir (the source of heat) makes a difference of one whole degree in the reading of the thermometer, or, in other words, in the temperature registered by the thermometer.

With some incubators the thermometer is simply laid on top of the eggs. This we consider a poor plan, for the average new hand with an incubator will be careless in handling the thermometer and the bulb may vary from a quarter of an inch to half an inch or more in distance from the source of heat, that is, from the bottom of the tank or hot-air reservoir, the result being a variation of from one to two or more degrees in the *actual* temperature of the egg chamber, though the thermometer may show the desired 103 degrees. It is far better, we think, to have the thermometer arranged so that when it is placed in position, as per directions, the bulb will always be on the same level and at exactly the same distance from the source of heat; then this thermometer will at all times register the temperature at a given distance from the source of heat, say at a level with the top surface of the eggs, and a *uniform* temperature may thus be insured at all times, at least so far as the location of the thermometer is concerned.

A man came into our office a few days ago and stated, during the conversation, that his incubator, a standard-made machine with a regulator that we know to be first-class, would not keep a uniform temperature, but varied from two to four degrees, even when the surrounding temperature was practically stationary. We asked him, among other questions, whether he was certain that he had the bulb of his thermometer located at a given level at all times. He said, "Why, no, I am not certain. I place it in on top of the eggs, and naturally suppose, when you come to speak of it, that sometimes it is from a quarter to a half inch or more lower than at other times. I have no doubt that sometimes it is on a level with the tops of the eggs, while at other times it settles down between the eggs and is half an inch or so lower."

When we told him that this fact alone was sufficient to

account for the variation of the temperature in the egg-chamber of his machine (over which the regulator seemed to have no control, though it appeared to work perfectly), he expressed his opinion that this was indeed the secret of the trouble, and was glad to have his confidence in the incubator and regulator restored.

No matter what incubator you have now, or propose to buy, when you come to operate it, make sure that the bulb of your thermometer is at all times on the same level. As a result of our experience, we prefer to have the middle of the bulb of the thermometer on a level with the top surface of the eggs. Note that we say "middle" of the bulb of the thermometer, for this bulb itself is from a quarter to three-eighths of an inch in diameter (some are even larger), and it is worth while to be exact in operating an incubator. Let us be exact, as far as we can, for there will be enough chances against us at best and we want all of the chances we can control to be on our side.

Do not sprinkle the eggs. This lowers the temperature too suddenly and is therefore hurtful. If the machine, through some cause runs up too high, dampen a towel or cloth in *warm* water and spread it out over the eggs in the tray, leaving the tray in the egg-chamber but not closing the egg-chamber door. Should the heat run up as high as 112 degrees you may still save the hatch by the above plan, providing the excessive heat was not applied too long. At two weeks old the chick embryo will stand more of such abuse than when only one week old, and after the two weeks, handling, jarring, etc., do much less damage than during the first days of the hatch when the chick embryo is first taking form. Be governed accordingly.

FILLING LAMP—TRIMMING WICK.

It is important that you should fill the lamp of your incubator and trim the wick *twice a day*, morning and evening. The reasons are plain. A steady blaze and an even heat are essential to best results. The wick will not draw so much oil from the lamp that is nearly empty as from one that is half full or nearly full and a charred wick acts as an obstruction to a clear, strong flame, thus diminishing the heat. The lamps ordinarily furnished with good incubators will burn twenty-four to thirty-six hours without refilling (depending upon the height of blaze), but if the operator were to fill these lamps only once every twenty-four hours and should forget to do so some cold night, the oil would give out and jeopardize the hatch. For these reasons it is wise to fill the lamp and trim the wick every twelve hours.

When you first start the incubator use a pair of shears to trim the wick. Have the wick slightly *rounding* in the middle, to produce an even, or slightly rounding blaze. After this trim the wick by turning it up until the charred part is exposed above the metal jacket, then simply rub a match across the end of the wick, removing the charred part. This is easily done and is all that is necessary.

Where it is convenient to use gas as the source of heat for an incubator it is better than a lamp, for with gas there is a steady supply of fuel as a rule, and no loss of heat results from a charred wick.

FOLLOW DIRECTIONS.

Follow closely the book of instructions sent you by the manufacturer of the incubator you are using. Machines differ in important essentials, and the man, or men, from whom you bought yours should know the requirements of *his* make of incubator, and this knowledge should be found in the book of directions he sends you. If he does not know how his incubator should be run, he didn't know how to build it in the

first place; but if you have a standard machine, then follow carefully what the manufacturer says about operating it.

Sometimes eggs begin to hatch as early as the eighteenth day. In that case the heat in the hatching chamber was too high. They should not begin to hatch earlier than the evening of the twentieth day, and the night of this day is better still. In hatching eggs and raising chicks by artificial means be guided as much as possible by what is *natural*, by what takes place when the hen does the hatching and brooding. The conditions the hen furnishes are those that we must provide in her absence, and the way the eggs hatch, or fail to hatch, the way the chicks thrive best or fail to thrive are where we must look for the *pointers* to put us on the right track. Bear this in mind.

WHEN THE CHICKS ARE HATCHING.

Never disturb the eggs when the chicks are hatching. Tell your curious neighbor it will not do. Control your own curiosity. Before this interesting time you can be more or less careless in handling the eggs, but after they begin to pip, keep hands off.

If the eggs were uniformly fresh and fertile the chicks should begin to hatch during the night of the twentieth day, or the forenoon of the twenty-first day, and 90 per cent of them should be ready to remove to the brooder by noon of the twenty-second day at the latest. Where eggs are of different ages, some of them fresh-laid, some of them one week old, some two, three, four and even five weeks old the hatching will reach out over four or five days, some hatching on the twenty-first day and others hatching along until as late as the twenty-sixth day. It is, of course, best to have eggs as fresh as possible. In cool or cold weather they *can* be kept as long as four weeks, and will hatch strong chicks, but it will take these old eggs some longer to hatch, and eggs not over two weeks old are much to be preferred.

When fresh eggs are used and none of them begin to hatch until the twenty-second or twenty-third day, this is proof positive that not enough heat was applied during the period of incubation, thus retarding the development of the chick in the egg and delaying the hatch. Make sure that the bulb of your thermometer was on a proper level in the egg-chamber, and if satisfied it was, then run the machine a degree higher throughout the next hatch. Half an inch up or down in the egg-chamber, as regards the *bulb* of the thermometer, means often as much as a full *degree* of difference in the temperature, hence the importance of this matter.

It is a good plan to make notes throughout each hatch, keeping a record of the temperature, taken every twelve hours, and noting down any other items in regard to testing the eggs, the application of moisture, the amount of ventilation used, etc. Then when you make any variation you can note results. The most important point is to know all about your eggs. Eggs used for hatching, in order to obtain the best results, must come from vigorous stock, that is, in good breeding condition, meaning not too fat; must be uniformly fresh and really should be from the same breed. Considerably better results will be obtained from two hundred Leghorn eggs, two hundred Plymouth Rock eggs or two hundred Brahma eggs, run separately, than would be the case if a third each of the three kinds were placed in the same incubator and run through the hatch together. These eggs vary considerably in thickness of shells; hence the same amount of moisture will not do for all of them and not so good results will be obtained in this way. All possible pains should be taken in matters of this kind, and then the owner of the incubator will be satisfied with his or her investment, and will not join the ranks of those who are indifferent in their methods and then blame somebody else.

JOHN W. MYERS.

THE INCUBATOR AND BROODER vs. THE HEN.

Modern, Improved, Standard-Made Incubators and Brooders Have Come to Stay—What Can Be Done With Them as Compared With the Hen Method of Hatching and Raising Chicks.

BY GEO. ERTEL.

Of the Geo. Ertel Co., Manufacturers of the Victor Incubators and Brooders, Quincy, Ill.

WE MIGHT SAY, in place of the above heading, new and improved methods as compared with antiquated ones. During the last fifty years one improvement has followed another so fast in nearly all lines of trade and manufacture, that to-day almost entirely different methods are brought to bear to bring about like, or even far better results. The amount of labor has been greatly reduced, the length of time required perceptibly shortened, and consequently the cost of production greatly lessened, and the quantity of the output wonderfully increased. Yet the demand, instead of being quickly satisfied, has kept pace with the improved methods and, with possibly a few exceptions, is still active.

In no branch of business has the necessity for better, quicker and greater labor-saving devices been more keenly felt than in the poultry industry. While some effort has been made to produce the egg of the hen, all attempts up to the present time have failed to bring forth anything that would compare with it in commercial value, which still leaves to the poultryman, the farmer and the housewife a ready market for produce of this kind.

We might enter into this matter further and show to you how remunerative this industry has proved, and how the demand is always greater than the supply, for no one ever heard of eggs or poultry of any kind being thrown away, or being so cheap that it would not pay to market them, as is often the case with all other products of the farm, the amount of returns in some cases not being sufficient to pay the cost of production.

While the old methods, due to the tendency of the hen to sit, are still practiced by non-progressive persons, to produce chickens, the incubator and brooder have so far outclassed her in this regard that even the most bitter antagonists of this method are seeing the way the tide is turning and are beginning to realize the practicability of their use, and have decided to investigate further.

In the thousands of letters that come to our office every season, we constantly receive communications from patrons who say that all manner of influence was brought to prevent them from purchasing, citing cases where some one had purchased a machine and relegated it to the wood-pile, as it proved an egg-cooker; or another who had heard they were regular fire-traps. Then again they often say, "My neighbors were all laughing at me," and they then continue with, "but I hatched nearly 90 per cent of the fertile eggs in my incubator, and am taking good care of the chicks in the brooder, and they are growing fast, with not so much trouble as one old hen.

We now have several hundred chicks, while our neighbors have possibly one-tenth of that number, and they have worried more over theirs and devoted more time to them than I have to my whole flock. They now see how easily I succeeded and are themselves going to use machines next year." It would not be amiss here to say that hundreds, yes thousands of people investing in machines of this kind have sold the produce of the first hatch for more than enough to pay for the machine, and the cost of feeding, leaving a nice profit besides.

Regarding that mistaken idea of "fire-traps," let us stop and do a little figuring. How many machines of this kind do you suppose are sold every season? Would it surprise you if I said fifty thousand? In five years this would make two hundred and fifty thousand. Now, how many fires have you heard attributed to incubators and brooders? We do not know of a single instance, where the machines used were of standard make! Cheap affairs made by cheap and unreliable manufacturers should not be classed as standard makes, and it would be well here to advise you not to take the manufacturer's word for all that may appear in his catalogue, but investigate not only his responsibility financially, but his integrity and reputation for treating his customers as he represents. The best manufacturers will treat you right. There is no machine of whatsoever kind that may not prove a failure in some instances, but there are several first-class machines on the market. See to it that you get one of these.



MR. GEORGE ERTEL.

Regarding the essential points of an incubator and brooder, it is hardly necessary for me to dwell upon them, as different manufacturers have different ideas. Satisfy yourself regarding the machine you want to buy. Investigate carefully the maker's reputation for treating his patrons fairly, then make your purchase and convince yourself that the old hen as a hatcher and mother certainly must give way to that wonderful step toward progression, the up-to-date incubator and brooder.

LET US THEORIZE A LITTLE.

As it is my desire to show you the advantages and economy of these machines suppose we do a little theorizing. To make money in any line of business you must produce enough, or do a sufficient business to make the income exceed the output, and while the expense depends on the amount of business done, yet there are hundreds of men and women in business to-day who are devoting their whole time to a small stock, when by greater effort and the adoption of present-day ideas, they might do many times the quantity of business, without increasing the expense of operating to any appreci-

able extent; for the greater the quantity of business, the smaller the amount of expense in proportion.

There is no better illustration of this than in the poultry industry. For example let us suppose that you would like to raise six hundred chickens for market this next spring and have them ready to market in January, February and March, when the prices are the best. A hen, we will say, sits on thirteen eggs and hatches ten of them (you see we are generous), thus requiring sixty hens to hatch the six hundred chicks. But how many of these will she raise? Let us say one-half. That is another generous estimate, but this makes us double the number of hens and the number of eggs to get the required six hundred chicks for marketing. It would take ten to twelve weeks to grow these chicks to marketable size, making it necessary to set the hens during September, October and November. This would call for 120 hens set on 1,560 eggs. At this season of the year *they could not be found*. It isn't possible, is it?

Any first-class incubator (and the incubator will sit at any time) will hatch 75 per cent of the fertile eggs. Inasmuch as we have assumed that all the eggs under the hens were fertile, it is fair to assume that all those placed in the incubator are also fertile, but as we have so much the advantage of the old method we will take 1,200 eggs. Of these, 100 of them prove to be infertile, which would leave us 1,100 good eggs, producing (by a 75 per cent hatch) 825 chicks that will be free from lice, the greatest enemy the chick has, and free from any other disease, for the incubator is not infested with or subjected to the diseases prevailing among poultry. All that is necessary is to keep the egg chamber clean and properly ventilated. The latter is provided for by the manufacturers of standard makes.

But these 825 chicks must now be raised for market. To do this we will use some of the best and most scientific brooders, such as have a reputation for bringing to the desired age fully seventy-five per cent of the strong, lively chicks entrusted to their care, for these machines when properly cared for are like the incubator, free from all the diseases to which the old hen is subjected, thus greatly reducing the mortality among the chicks on this account alone. Then, again, it is stationary and does not take its flock of chicks out in all kinds of weather, running with them through damp grass, and finally settling down for the night in almost any place but the one you have provided for her, thus furnishing all the enemies of poultry with the very opportunities they are looking for. The brooder, not being gifted with the power of locomotion, is always where you put it, and the chicks, soon learning that in it they can get warm at will, never wander very far away, even if given free range.

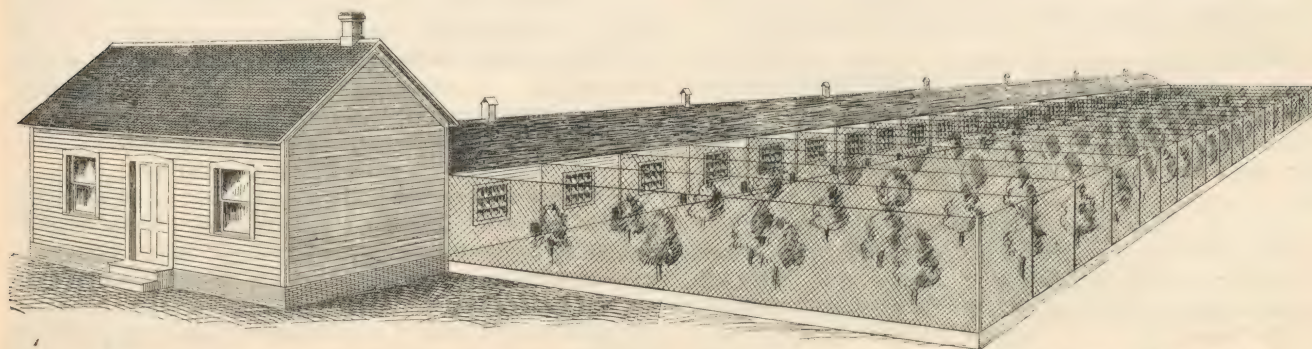
Now let us consider the expense and profits involved. A good incubator of 200-egg capacity, can be brought for \$20 to \$30. A good brooder, we will say, will cost \$20 more. Total, \$40 for machines. Twelve hundred eggs, or one hundred dozen

at twenty cents per dozen equals \$20. Twenty-five gallons of oil at twenty cents, equals \$5, giving us a grand total of \$65. The natural process can not be estimated in this way, for you could not get enough broody hens to hatch and raise the chicks at this time of the year. But you have raised 618 chicks with the incubator and brooder which will sell for from forty to sixty cents each. At the lower figure you will receive \$247.20, leaving a net profit of \$182.20, all made during a season of the year when you have little else to do. The poultry business for the farmer is surely full of great promise and possibilities and we expect to see the day when every farmer will consider an incubator and brooder indispensable.

It must be perfectly apparent then that in order to take advantage of high prices, you must resort to some other means than "the hen that will not sit" and the incubator and brooder have been provided to meet your demands.

But we will suppose that hens are set so the chicks are ready for market as early as it is possible for them to be when hatched and raised with hens, which would be the latter part of April, and during May and June. Ten and twelve weeks after this, when the chicks are ready for market, the market prices are reduced to twenty-five and thirty cents a piece, making a grand total of \$180 received for the 618 chicks. The value of 120 hens at forty cents apiece is \$48. Their feed for twelve weeks at two cents a week per hen is twenty-four cents for each hen, saying she devotes twelve weeks of her time to the chicks, which makes the feed for the whole flock amount to \$28.80. Extra cost of 360 eggs, or twenty dozen in excess of the number required to get the same results in the artificial way, will be at twenty cents a dozen, \$4, making a total expense of \$80.80. This does not take into consideration the room required for 120 sitting hens, nor the hours of time required to look after the treacherous hen, to see she gets on the right nest, that she does not stay off too long; that some other hen does not lay its eggs in with the lot that is set and that the sitting hen is not bothered in other ways, in fact occupying a great deal of time. It should not be necessary to dwell on the great labor of looking after one hundred and twenty hens with a brood of ten chicks each, or half that number with twice as many. It would almost set one crazy, yet of the two evils we would advise the former, for if a hen is given too many chicks to raise the mortality increases in proportion. Here we have an expense of \$80.80, and a man's or woman's time by the hour, day after day, for fifteen or twenty weeks! There is quite a difference between this and \$182.20, and the incubator and brooder will positively require but a small portion of your time, allowing you to devote the greater part of it to other matters. Isn't this worth considering and striving for and having? The incubator and brooder used intelligently are time-savers, labor-savers and money makers.

GEO. ERTEL.



CUT SHOWING EXTERIOR OF LAYING HOUSE FOR HENS AS ILLUSTRATED AND DESCRIBED ON PAGES 36 AND 37.

LEARNED IN THE SCHOOL OF EXPERIENCE.

Best Location for Incubators—To Get an Equable Temperature—Importance of Exact Location of the Bulb of the Thermometer.

BY G. A. C. CLARKE, BREEDER, LEMARS, IOWA.

INCUBATORS can be, and are, successfully operated in all sorts of places, in parlors, offices, cellars, and I have known cases where they were put out in the barn and a good hatch resulted. The better grade of machines will stand successfully, the most abuse as to location. The ideal place in which to put the machine is in a cellar, or dugout, which should be reasonably dry, and which can be set apart for that purpose alone. Do not try to run an incubator in a cellar containing vegetables or anything which will taint the air; do not put it where you would not care to live yourself, if necessary.

The instructions sent out with incubators as a rule, lay great stress on the desirability of placing the machine as level as possible. Now, I have not had the opportunity to handle a great number of machines, nor am I cognizant of *all* the different makes on the market, yet what experience I have had leads me to believe that there is *no* incubator now in use that (placed perfectly level both ways and with four or more thermometers placed at the four sides of the egg tray and all equidistant from the wire bottom of the tray), will show at all times an even temperature in all parts of the machine. This, I think, is especially true of the hot-air incubators as usually ventilated, for the reason that there are currents of air constantly passing through the machine. Furthermore, those even of the same make vary in the above respect and must be adjusted in accordance with their individual peculiarities.

AN EQUABLE TEMPERATURE.

Every year, before putting my machines in use, I devote a whole day, or as much thereof as is necessary, to leveling (?) my incubators, so as to procure as equable a temperature as I can. I use four thermometers in each tray, and these are tested by comparing the readings with those of two clinical thermometers, all the instruments being put in a bowl of warm water, which is kept stirred up when testing. Following are a few comparisons showing the different temperatures under varying conditions as to level, and incidentally illustrating the before-mentioned currents of warm air. The machines I use are of standard make, hot-air style. They are 100-egg size, single tray, and during all tests the ventilators were wide open.

Incubator No. 1 (started March 1, 1898), with machine level both ways, left rear corner, 101 degrees; right rear corner, 102; left front corner, 100; right front corner, 101. With the left end a quarter of an inch high the thermometers read (in the order named above) 102 degrees, 101½, 101½, 100½; with the left end a half of an inch high and the back a quarter of an inch high, the reading was (in same order) 102½ degrees,

101½, 103, 102. I let this adjustment of incubator remain as it was, and found that the thermometer in the left rear corner registered 101½, and the other three were at an even 102.

Incubator No. 2 (started March 15 1898), with machine level both ways, left rear end, 98 degrees; right rear end, 100; left front end, 98; right front end, 102. With the left end raised half an inch high, the thermometers read in order named, 100, 99, 101, 100; with the left end a quarter of an inch high and the back also a quarter of an inch high, the reading was 102, 101½, 101½, 103. Left in this position (five minutes later) the reading was 103, 102, 102, 102½; thirty-five minutes later it was 102, 102½, 103, 103.

The essentials for a good hatch are the same, whether the heating medium be hot-air, hot-water, or the heat generated by hen power. The requisites are (in the order of their importance as I see them), first, strongly fertilized eggs from vigorous stock, not fat, allowed a good range, or in default of this, a goodly scratch-pile in which to exercise and work off superfluous flesh; second, no moisture (supplied) under ordinary conditions. In every case where a chick (in the egg) is able to pull through for eighteen days and then is not able to break its way out of the shell, the trouble is caused by too much moisture. To those who have had experience as outlined above I would strongly advise using absolutely no moisture in the

pens, cups, sponges, etc., and note results, provided always the eggs are hatchable.

Often we have complaints of poor hatches, 20, 30 or 40 per cent. Now, if any eggs hatch why not all of them? There can only be three reasons for such an effect and they are: poorly fertilized eggs lacking vitality, using only one thermometer in the machine without *knowing* that it is properly adjusted, hence will subject some eggs to greater heat than others; and the use of eggs, some of which have been chilled (as will quickly happen in freezing weather) so as to destroy the germ. Such being the facts, the operator should not condemn a machine as worthless in case of a poor hatch. Neither is the management always at fault except with reference to the care and selection of the breeding stock.

AN EXPERIENCE WITH MOISTURE.

I have had this year a little experience as to moisture. Last fall a heavy rain made the floor of my incubator cellar *wet*, owing to there not being any eaves-trough on the roof of my workshop, under which is the cellar. So damp was it there that the doors of my machines swelled so that they could not be opened until after I had the incubator lamp burning some time to dry the woodwork. I placed some lime in the cellar to absorb the moisture as much as possible, and the



MR. G. A. C. CLARKE.

first hatch, which came off February 21, was run through without using any moisture at any time in the machine. My rule has been not to put any moisture in the pans until I notice the membrane next to the shell becoming dry and hard, as seen when the chick is breaking its way out; then I put in hot water enough so that a slight steam shows on the lower edge of the glass doors. Do not put in enough to make the water run down the glass.

THE AMOUNT OF MOISTURE.

In regard to amount of moisture to give, if any, during the hatch, I am guided by the size of the air-cell, keeping it as near as possible equal to the air space shown on Mr. Campbell's chart. (See diagram of egg, page 26). For this purpose pick out six or eight average sized fertile eggs, compare their air space every day, after the sixth, with the chart and mark them so that you can use the same eggs in comparing. Place the thermometer on the (fertile) eggs thus marked.

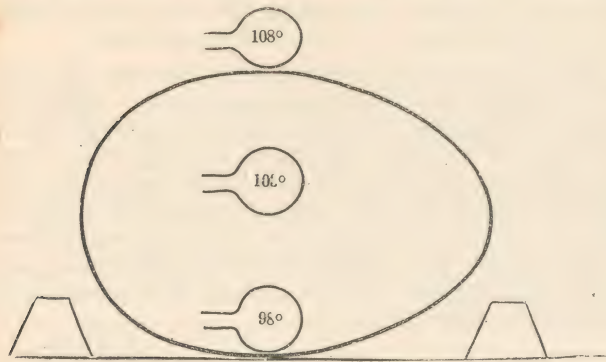


FIG. 1.

bell's chart. (See diagram of egg, page 26). For this purpose pick out six or eight average sized fertile eggs, compare their air space every day, after the sixth, with the chart and mark them so that you can use the same eggs in comparing. Place the thermometer on the (fertile) eggs thus marked.

HOW TO PLACE THE THERMOMETER.

The book of directions for my incubators says: "Place the thermometer bulb on and between two fertile eggs immediately above their centers." It does not say whether it is to be the top, center, or bottom edge of the bulb which is to occupy this relative position. I think, nay I am sure, it makes considerable difference how the thermometer is placed. The following diagram will better illustrate my meaning than words alone can. See Fig. 1.

Taking the average diameter (the short way) of eggs to be between $1\frac{1}{8}$ and $1\frac{1}{4}$ inches, a thermometer placed with the lower edge of its bulb resting on the top of the egg will show nine or ten degrees higher temperature than if the bulb and the egg both rested on the same plane, the bulb being about $\frac{3}{8}$ inches in diameter, though they vary somewhat. Keeping this fact in view it is therefore advisable to note carefully the position of the bulb when the regulator is first adjusted, and every time you remove it for the purpose of turning the eggs be sure you put it back exactly in the same position. If you do not you will be under the impression that your regulator does not regulate, so great will be the different temperatures shown at different times.

After about the eighth to tenth day the fertile eggs will themselves give off heat; therefore the regulator (or lamp flame where there is no regulator) will have to be adjusted accordingly. In my machines the chicks, after hatching, most all go below the egg tray, thus lessening the amount of heat among the eggs yet unhatched. Be careful, therefore, to fasten a thermometer in the same position as if placed on an egg (if not so fastened the chicks will surely displace it); and during hatching, do not let the heat run below 102 degrees.

The lack of heat at the pipping stage is a very fruitful cause of chicks being stuck in the shell.

All the chicks worth saving will be out by the morning of the twenty-second day, if the heat has been kept fairly regular and the eggs were reasonably fresh when put into the incubator. Leave them in the machine till the morning of the twenty-third day and have the brooder heated up to ninety degrees ready to receive them.

Referring again to the exact location of the bulb of the thermometer, I will say that Dr. McWilliams, of Chicago, thus wrote to me: "Here is what I did twenty or thirty times. I took three of our best *self-registering* physicians' thermometers. I then took a block of wood, one and three-quarter inches in height, and six double-headed tacks, and fixed them thus: See Fig. 2. I got only a difference of three to six degrees between the top and bottom in the — Hot-Air, or the — Hot-Water Incubators."

By referring to the egg cut (Fig. 1) it will be noticed that I found a difference of ten degrees between top and bottom of egg. This may be due to a slight inaccuracy in my thermometers (they are ordinary incubator thermometers), but I am nearly sure it can be put down to the difference in self-contained heat between my fertile eggs and Dr. McWilliams' block of wood. However, the doctor wrote me later that he intends testing the matter further by placing his self-registering thermometers so that the bulbs shall touch a fertile egg.

Now as to the proper incubating temperature: I have had the best hatches where the top of the thermometer bulb has been placed level with the top of and touching two fertile eggs. Run the heat as near as possible to 103 degrees the first ten days and 104 the second ten days. If, when the chicks begin to pip the shell, the heat should run up to 105 degrees, do not readjust the regulator with the idea of lowering the temperature. I have further come to the conclusion that an egg laid in April or May will stand more abuse (as to irregularity of temperature) and hatch a stronger chick than will an egg laid in the colder months of winter.

I have a home-made hot-water incubator, the tank holding twelve gallons, with the heat supplied by a lamp—no regulator or lamp trip. This spring I ran it (for the first time) the full twenty-one days. The heat varied during this period

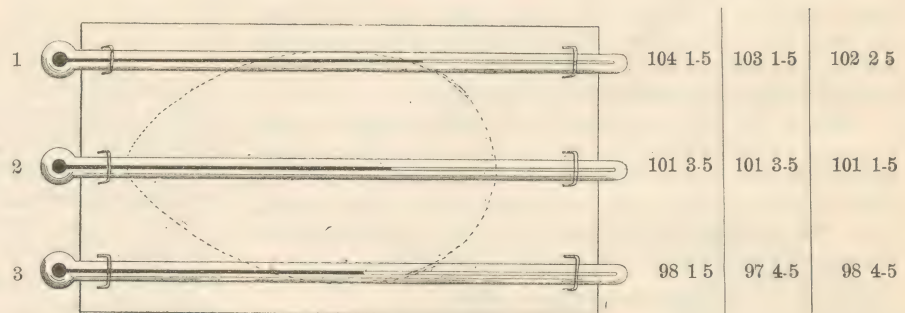


FIG. 2.

from one hundred to one hundred and six degrees, the result being sixty-eight chicks from seventy-seven eggs tested on the sixth day.

In my standard incubators the difference between the minimum and the maximum temperature for the twenty-one days is never more than one and one-half degrees. In either (or any) style of machine a person has to learn its particular workings in order to get the best results. He has to closely watch the development of self-contained heat in the eggs after the tenth day. With regard to my home-made incubator, I will say that of course owing to the large body of water, the changes in temperature were not sudden but very gradual. At no time was the variation more than one degree in six hours.

In conclusion I may say that success with incubators depends on the following:

First—A fresh, strongly fertilized egg, the product of healthy, vigorous, mature stock. The egg from a year old or over hen will produce a livelier chick, and one that can stand more moderately hard usage than will the egg from an immature pullet. If you use an incubator and have both hen and pullet eggs from which to get your crop of chicks, hatch the hen eggs artificially, but the pullet eggs naturally, if possible. Put hen and pullet eggs into the same incubator, and of those chicks which die in the shell you will find a large majority are contained in the eggs laid by the pullets. It is assumed, of course, that the conditions affecting the breeding stock are similar, both as regards feed, care and other essentials.

Second—Temperature should be as near as possible 103 degrees the first ten days, 104 degrees for the second period of ten days—the bulb of the thermometer to be between and touching both of two fertile eggs, the top of the bulb level with the tops of the two eggs.

Third—Ventilation enough to dry out the contents of the shell so that the air space in the large end may be of sufficient size to give the chick room to turn itself round when breaking the shell. This will require some study and observation in order to get the required amount of air space. The shortest road to success in this line is to set one or two hens the same

day and in the same place as that in which is your incubator. Compare the air space of the eggs under the hens with that of the eggs in the machine. Make this comparison frequently (say every second night) during the incubating period.

Fourth—Moisture. In any underground location, such as a cave or cellar, my experience teaches me that no moisture is necessary in *most* of the hatches, and only a very little when chicks are coming out if the outside air is very dry and has been so for several previous days. The size of the air space in the large end of the egg depends on moisture and ventilation. In a cellar, especially in damp weather, it is a hard enough matter to evaporate the eggs sufficiently, and to add moisture artificially, there being already a surplus naturally, is only to endanger the chances of a good hatch.

Fifth—Hands off at hatching time. Do not open the doors of your machine under any circumstances. To do so is fatal to the welfare and subsequent thrift of the downy chicks you have been patiently waiting for for twenty-one days. Many incubators are now made with ample space under the egg-tray so that most of the chicks when hatched will drop down into the nursery where they are out of the way of those coming out of the shell. Leave them here for thirty-six hours from the time the first one hatched and go to make ready the brooder to receive them.

G. A. C. CLARKE.

PROPER CARE OF BREEDING STOCK.

Correct feeding has an important bearing upon fertility. An underfed cock will lack in vitality. His amorous propensities will be greatly reduced. He will attend to but few hens, and the germs will be lacking in vigor. An overfed cock will be more amorous, but fat interferes with the secretion of the spermal fluid. If very fat, he will become too sluggish to arouse himself enough to meet the demands of the breeder. But a cock, properly fed, both in quantity and quality, will be amorous and will develop in his system an abundance of vigorous sperms.

Quality of food is quite as important as quantity. The food which makes muscle and health, rather than fat, is the food required. Plenty of oats, some wheat, very little corn, and some lean meat will put the male bird into the best condition for breeding, so far as feeding alone can do this. But feeding must be supplemented by other things.

One of the most essential of the "other things" is exercise. A cock which does not get plenty of exercise is admirable to eat, but of very little use in the breeding yard. He needs to keep stirring about, scratching for the hens, crowing with vigor, and the like, to keep his blood and muscles and the various organs in the best condition for service.

CARE OF BREEDING HENS.

The condition of the hens, however, is quite as important as that of the cock. They should be neither too young nor too old. We do not like pullets to breed from, and there does come a time when hens lose their powers. Two to four years of age find the hens in their best breeding years. The hens, like the cock, need to be so fed as to be well nourished without superabundant fat, and freedom from vermin, exercise, and anything else which will promote their health will also

promote the fertility of the eggs. We do not like to have our breeders put upon a forcing system, so as to produce the greatest possible number of eggs, hence we avoid all condiments, but the diet which will put and keep the hens in the best breeding condition is also the diet which will induce them to lay quite freely. So that, while the number of eggs is of less importance than the quality of them, yet in getting the quality a goodly number will also be secured. This, of course, is very desirable and it is fortunate that it is so for it enables the breeder, from a comparatively small number of hens, to secure a large number of chickens. He can thus safely breed from his best birds.—H. S. BABCOCK, in R. P. J.

SUNLIGHT FOR CHICKS.

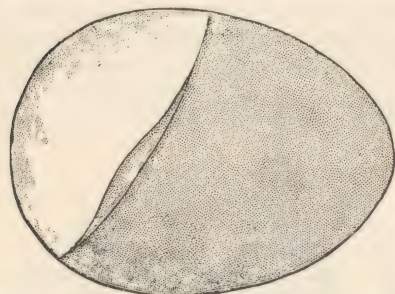
Sunlight is, in our belief, as essential to growing chicks as it is to growing vegetation. Do not, under any consideration, try to raise chickens either by the hen method or artificially, *without sunlight*. Arrange it so they can bask and wallow in direct sunlight, but be careful not to put them *under glass* that is low down, or so near to them that the heat will be too great. This will destroy their health and may kill them outright. Let them run out in the sunlight or enjoy the sunlight that comes through glass that is far enough away not to overheat them. As warm weather comes on, still allow them to run in the sunlight, but supply shade for them to go to at will. Be careful, also, of the blistering hot sunlight that we sometimes have immediately after a hard, spring shower. This hot, driving sunlight will kill very young chicks, and is even more dangerous to little ducks. Keep them in the coops until the grass and ground are reasonably dry after such a shower, no matter how warm it may be.

TAKING THE HEN AS A GUIDE.

A Number of Experiments are Conducted to Determine the Proper Size of the Air Cell—Conclusions as to Use of Moisture.

BY S. Z. HARROUN, DETROIT, MICH.

AFTER operating and experimenting with incubators for four years, with varying, but steadily increasing success, I am satisfied that with the modern machine, and properly fertilized eggs, the one great question to be mastered is moisture, and I am just as thoroughly convinced that no set rules can be given for the application of moisture, but every incubator operator must study it out for himself, according to the location of his machines, climatic conditions, etc., and that the only way to do this is to acquire as complete a knowledge as possible of the shape, size and appearance of the air-cell in a well fertilized and live egg, at different periods of incubation, but more especially during the latter half of the hatch. It is a wonder to me that incubator manufacturers do not realize this, and make a greater effort to inform their customers more fully on this point, instead of quoting them a set of arbitrary rules for the application of moisture under any and all conditions. I have had fair to



SHOWING AIR SPACE IN EGG UNDER HEN

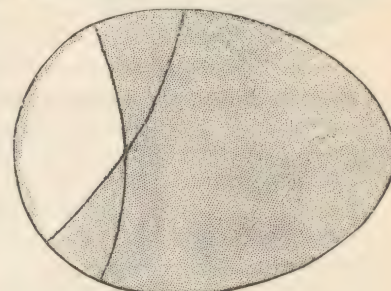
The best hatch I made last season was one where I had the eggs dried out as nearly as possible to the diagram shown in my book of instructions and then forgot them, leaving them out of the machine about four hours on the fifteenth day. On the nineteenth day the air-space was *much larger* than I had been getting, but I ran it through and got nearly a ninety per cent hatch.

I then determined to run the machine and hens together and compare notes, but as it was then near the close of the hatching season I was able to make only one trial, as follows: I placed sixty-nine eggs in a 100-egg machine and divided the same number among six hens, which were set in nest boxes placed directly on the moist earth floor of the hen house in a corner, which at the time of year, June, was never reached by the direct rays of the sun. The eggs in the machine I dried out, if anything, a little more than usual.

On the seventeenth day I removed all the fertile eggs from the hens, placing them in the machine with the others for comparison. I was more than surprised at the difference and was inclined to think the hens had "slipped a cog," but the hatch proved that they were all right, though it was the first time any of them had sat. The machine hatched seventy-eight per cent while the hens gave nearly ninety-eight per cent.

I present drawings from sketches made at the time, show-

ing as nearly as possible the average difference. I intend following out these comparisons more fully the coming season, setting hens in different places, keeping a full record, with sketches of eggs, at different periods. I have remodeled one of my machines in such a manner as to obtain several modifications in ventilating, by which I can dry out the eggs slowly or quite rapidly as circumstances may require as I find that while eggs will absorb moisture very rapidly, it requires considerable time to reduce their moisture in the modern bottom ventilated machine.



SHOWING AIR SPACE IN EGG FROM INCUBATOR.

My machines are, for convenience, located in my studio, a southeast corner room, opening into the kitchen on the west side, and a sitting room on the north. It has one east window, but no stove, the room being warmed from stoves in the two rooms mentioned. I air the eggs usually while I am at dinner, and after the twelfth day I examine a few each night to observe the moisture, using an ordinary egg-tester.

FURTHER EXPERIMENTS.

This season I continued my search for facts that will help incubator operators to apply the required amount of moisture to insure successful hatches, but owing to a pressure of other work, consequent upon a change of location, erection of new poultry house, etc., right in the breeding season, I have been able to obtain satisfactory data from but three hatches, still these were under so widely different conditions that the results obtained are probably as valuable as would have been those from a much larger number under average conditions.

All these corroborate my first conclusions, namely, that incubator operators should be able to judge from the size and appearance of the air-cell whether moisture or the contrary is necessary to obtain successful hatches, and further, that the average unsuccessful hatch is due to an insufficient *drying out of the eggs*.

My method in obtaining these sketches was to first prepare a number of outline sketches of eggs with a guide mark in the center of the large end, and a similar mark on each egg; then to test the eggs three times during incubation (on the 14th, 17th and 19th days—see drawings) carefully marking

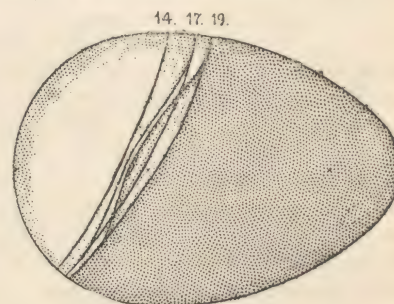


Fig. 1.

the size of the air-space on the shells; then by accurate measurements of several average eggs to transfer these marks to the sketches.

The conditions of each hatch and results were as follows: First hatch (Fig. 1).—The hen was set May 8 on thirteen eggs, from two-year-old hens; nest was about three inches of hay in the bottom of an exhibition coop, which was placed directly on the cement floor of the cellar. This floor was damp all of the time, and quite wet a part of the time. The

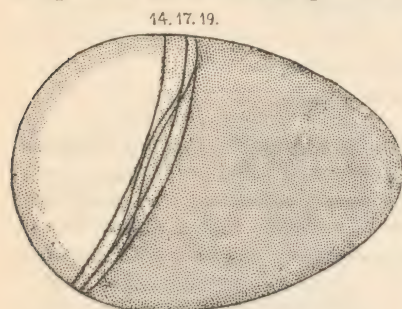


Fig. 2.

and marked on the fourteenth, seventeenth and nineteenth days. The hen was removed from the nest each alternate day during the first week, and daily thereafter. She was given a run of from fifteen to forty-five minutes in the yard, according to the temperature. The eggs were all pipped on the evening of the twentieth day, and twelve strong, healthy chicks were out before the noon of the twenty-first. At this date (August 5) all are alive and doing well, except one that was killed by accident.

Second hatch (Fig. 2).—Hen was set June 13 on fifteen eggs, eight from a two-year-old hen, the balance from a young pullet. The nest was a couple of inches of hay in an inch-thick box, placed on "a dust dry" earth floor of the henhouse, in a well-ventilated part of the building, where the sunlight struck on or near the nest nearly all day; the weather was exceedingly hot and dry, scarcely any rain falling throughout the three weeks. The temperature was so high that the hen "sat standing up" a good part of the time. The hen was free to leave the nest at any time, for dust bath, run in grass, etc., and did so daily, sometimes twice and three times a day. Two eggs were broken by the hen, and one was infertile. They were tested the same as number one, and showed practically the same results, pipping and hatching at about the same time, and also resulting in twelve fine chicks from twelve fertile eggs.

Third hatch, (Fig. 3).—This hen was set June 24 on eleven eggs, under almost identically the same conditions as number two, the only difference being possibly a trifle less ventilation or draft of air over the nest. The weather conditions were the same, except a little hotter at the end of the hatch. The hen was a persistent sitter, not leaving the nest to exceed six times during the hatch, and but a few moments at a time, covering her eggs closely nearly all the time. But three eggs were fertile, two from an old hen one from a pullet. These were tested the same way as others, except that the last test was made on the twentieth, instead of the nineteenth day. The air-space showed much smaller, with the chick apparently much larger than in the other tests. Two eggs pipped on the morning of the twenty-first day, but got no further, and were

the sun shone in through three small, west windows about two hours in the afternoon, when there was any sunshine. Rain fell at frequent intervals all through the hatch, and the temperature was very changeable, from one extreme to another. Twelve eggs were fertile. They were tested

taken from the shell on the morning of the twenty-second day, at which time the third chick was found fully developed, but dead and unpipped. The two that were helped out are still living, but are small, weak, and altogether unsatisfactory.

WHAT THESE TESTS PROVE.

These diagrams show that under almost opposite conditions of location, temperature and humidity the air-space in the first two hatches was practically identical (considerably larger than is shown as the correct size in incubator diagrams of instructions), and as both resulted in 100 per cent hatches of strong, healthy chicks, we are forced to the conclusion that it must be about correct. In both hatches the eggs were plentifully cooled and ventilated. In number two, besides leaving the nest frequently, the hen obtained still further cooling of eggs by simply standing over them, her body not being within an inch of the tops of the eggs. This she did for a considerable length of time at frequent intervals.

In number three the eggs were but slightly cooled or ventilated, the moisture being retained in the eggs, with the air-space so small that even the chicks that pipped were unable to extricate themselves, and but for timely attention the hatch would have resulted like so many incubator hatches, *i. e.* "some eggs pipped, but all chicks dead in the shell."

My deductions are as follows: In number one, while the humidity of the air was considerable, it was never equal to that in the air-space, or cell, in the eggs. When the eggs were cooled, the natural contraction expelled a portion of the air in the egg, together with considerable moisture, this amount of air being replaced by the same amount of dryer, outside air, on the eggs again being warmed. This outside air being compelled to pass through the thick feathers of the hen to reach the eggs, unquestionably lost considerable of its moisture. In number two, with the outer air so dry, one might think that less frequent cooling would be necessary to obtain the same results, but the outside temperature was much higher, going at times to ninety degrees, or a little over, consequently the contraction of the egg would be very slight and the amount of air changed each time almost infinitesimal, necessitating *more frequent* cooling of the eggs. (Cooling for a longer time would not accomplish the desired end, as no matter how long the eggs were exposed they would not go below the outside temperature.)

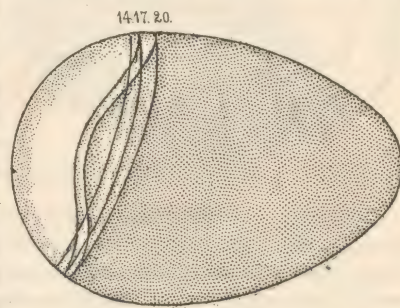


Fig. 3.

As my machines have been idle this season, I am unable to give any further results from the practical application of these observations, but from results obtained last season, I am confident that the data I have been able to obtain from mother nature will prove of great benefit in the future, and I again unhesitatingly advise all beginners with incubators to operate their machines by the appearance and size of this "air-cell" as affected by their own special locality and environments.

S. Z. HARROUN.



BEST BREEDS FOR BROILERS.

Valuable Points on Broiler Raising by a Man Who Achieved Success in This Line—The Merits of the Light Brahmas, Leghorn-Brahmas, Wyandotte-Brahmas, Barred and White Rocks and White Wyandottes Set Forth.

BY ARTHUR G. DUSTON, BREEDER, MARLBORO, MASS.

AT THE request of the editor I am going to present some hints on broiler-raising as exemplified by me on my farm in Marlboro, Mass. I have thought best to divide these into two papers—one on varieties and their comparative values, the other on forcing for growth. I believe that many lose courage in raising broilers by not obtaining the right stock.

First, many take Brahmas. They might do far worse. Let us take the Brahma from the egg and follow it. Some claim that Brahmas are superior for this purpose. Yet, in an argument with an incubator manufacturer, a prominent Light Brahma breeder's first and best-proved claim is, that they do not hatch as well artificially as eggs from the American or Mediterranean classes. Does it pay to put eggs in machines that will make the chicks cost, on coming into the brooder house, 25 to 50 per cent more than others?

Once in the brooder, Brahmas prove very strong as little chicks, but look out for leg-weakness, their heavy bodies proving too much for small legs.

Again, any one watching chicks raised artificially knows that they will attain their height earlier than those raised with hens. So a Brahma chick has that against it as a broiler, for long legs with feathers on them hurt a fowl in the market. But, properly taken care of, Light Brahmas will prove fairly satisfactory as broilers. As roasters, which subject can not be even touched on in this article, they are choice.

While the Brahma is under consideration it seems well to take up two of the more popular crosses made with them, viz: Leghorn on Brahma and Wyandotte on Brahma.

Leghorn on Brahma have some very good points which are: Yellow skin and legs and fairly plump bodies. They also feather early, but a large proportion of the early cockerels will be so near full blood Leghorn that they would readily be taken for them by a casual observer, and to force them, giving a liberal quantity of meat or ground bone, together with the heat, will develop extremely large combs, which gives the appearance in a dressed bird of its being old—a point against us. Furthermore, the nervous temperament of this cross (taken from the Leghorn) keeps them from making flesh, where other varieties would take on fat.

I have run this cross where at fifteen weeks I could not force at least twenty-five per cent of them to weigh more than from one and one-half to one and three-quarter pounds.

The Wyandotte-Brahma cross is almost ideal, being hardy,

low-combed and not getting "stagy" at an early age; as with the Leghorn cross; but, my dear reader, do you know there is something in the feathered leg that is not inviting to the buyer? To see a neat, yellow breasted broiler with a mess of feathers on the legs and feet will detract from their appearance more than one would think unless he has had the very fastidious market of Boston to cater to. The carcass of this cross is plump and yellow, only a small proportion coming so dark as to have black pin feathers enough to injure the looks.

To leave the Asiatics, we will touch on the Barred and

White Plymouth Rocks. The rich yellow legs and bodies of these justly popular fowls, the quick growth, with not enough comb to hurt, gives us a broiler hard to beat—one of the worst faults being dark pin-feathers in the Barred, which are always somewhat objectionable in a broiler, for the reason that they are put on the market at an age when it is impossible to get them all out.

I can not go through all the breeds, but will only take up those I have *honestly tried*. This brings me to the last, the White Wyandottes. To be frank, I will state that I once thought of discarding this breed as not fitted for my business purposes, but after "summering and wintering" them, I now feel that I would drop all other breeds before I would the reliable White Wyandottes.

Let us note their faults. The first is that in some birds, more especially those bred for extreme whiteness, you will find they are not yellow-meated. At the same time I have seen the whitest plumage

birds have rich, yellow skin, beak and legs. In buying stock look for yellow beak, and as yellow a leg as you could naturally expect *at the time of year* you are buying; that is, make allowance for a bird hived up in a yard, with sand to dust in, as it will surely bleach them to a flesh color.

Another trouble you may have with the Wyandotte, as perhaps you would have with no other breed, is, confining a large number in a small pen, they easily take up feather pulling. I think this is due to the peculiar way in which they feather. Some will grow to weigh one and one-half pounds before they have any but neck and wing feathers. Then the pin feathers start all at once, making the habit easily formed by the "chicken act" of striking one another, or picking off any soft food that may adhere to the feathers. But plenty of green food will obviate that to a great extent, especially should that food be freshly cut clover. Of course it cannot be obtained in winter, but well-cured clover rowen can. With care after this warning, you need have no trouble in this direc-



MR. ARTHUR G. DUSTON.

tion. Regarding white skin, I will tell you in my next paper how to overcome that by the use of the right kind of food, making it yellow enough to suit any one. Now that we have seen the faults of the White Wyandottes in their worst light, let me extol their virtues as broilers, for they have many.

The eggs being reasonably thin-shelled hatch as well as any you can get.

They mature as laying pullets a full month earlier than Plymouth Rocks, thus giving you eggs for early hatching.

Their clean, yellow legs, low combs, white pin feathers, and quick growing qualities, render them the best broilers I can put out.

I sold hundreds to dress eight ounces (one-half pound) this year and they were as round as a "butter ball"; this being one of their most important merits, that when properly fed they are *always* ready for market.

Again, they will stand all the forcing any bird can. If you try to raise Rocks and Wyandottes in the same pen, the experiment will prove to you this fact: Your Rocks will go "off their legs," while the deep-breasted, plump-bodied, smooth-skinned, active little Wyandottes take their medicine *five times a day* and stand as straight as matches. Remember, it is generally the bird that can stand the greatest amount of

food that makes the quickest grown broiler, and *must* be the bird you should adopt, as every additional day means additional cost from labor, coal and food.

I have written this article from the market point of view, that is, the sales-counter, as that is where our returns come from.

Now, for one moment let us look at the matter as epicures. Take any one of the varieties mentioned above, and the Wyandotte besides having the extra flesh on breast, as I stated before, caused by the great depth of breast-bone, is as juicy and delicious as any, and in the opinion of "our folks", more so, a dish luscious enough for a king.

This is just my experience briefly set before your readers. If I have written anything that will in any way aid my brother poultrymen, I am satisfied.

One word in closing. Do not be in a hurry to cross your stock, as no one can make me believe again that there is anything gained by crossing, for there is no place that a thorough-bred of some variety will not fill the bill, and once you start to cross where can you stop? The labor and skill of years come to naught when you destroy the integrity of a breed or strain by crossing.

ARTHUR G. DUSTON.

FEEDING AND FORCING BROILERS.

Second Article by Mr. Duston—The Facts He Presents Have Cost Him Many Dollars in the School of Experience.

We will say, that we have decided on the variety that we will run; our eggs are as *fresh* as possible and of *uniform* size; we have put them into some well made incubator, and with *proper care* have gotten out a good hatch which came along promptly so that the morning of the *twenty-second* day we find the chicks nicely dried off. We now get our warmed, cloth-lined basket, with a heavy cover or shawl to prevent them getting chilled.

Right here I want to say, I believe more chicks "pass out", as our Christian science brethren would say, to the land whence no wanderer returns from getting chilled in moving them from a warm, moist incubator on a cold day into the brooder, than most folks are aware of, and those little fellows you had such fond hopes of, but lost last winter with what you called bowel trouble or diarrhea, were really chilled in being changed from birthplace to their temporary home.

Well, we have got them safely, we hope, into the brooder, which has been brought up to the temperature of the incubator. Of course we have placed our board in slides about a foot outside of hover, so that the babies can not get out in the long pen and not be able to find the way back and thus get chilled. Just bear in mind for the first week that to keep them *warm* is more essential than food.

The first day of their lives in a brooder has almost passed and they have not eaten anything but *sand*. Night has begun to come on and it is time to feed the hens, but, let us first scatter down for the babes a liberal supply of rolled oats, the white flakes of which will instantly attract them, and they are left to themselves. In the evening, as we fix the fire preparatory to locking up for the night, we look at them and are pleased to find them scattered all over the hover bottom, and their contented little "peep" is the last sound to fill our ears as we go out, and our mind is already filled with visions of juicy broilers and big breasted roasters and the perquisites thereunto attached.

The next morning as we turn out at daylight to see our orphans we find them calling for breakfast. We touch up the

fire and then a feed of rolled oats is given them with a dish of warmed skimmed milk. We use an old fruit can for this purpose with a notch cut in the edge. Partially filled with the milk and inverted into a saucer, this makes an elegant fountain for small chicks. A saucer not much larger than the can is best, then the chicks will not get "stuck up." The milk on the down will stick them together as bad as paste would. Some of the little fellows that would not eat will drink, so you save them along until they will eat.

That you will save more chicks by giving them warmed skimmed milk than by any other system of feeding grain, is my way of thinking.

We next powder some charcoal in a Wilson \$5.00 mill and this is put into a dish and set in for the chicks to eat. We have found this an excellent regulator for very young chicks, as well as older birds.

We are now going to feed every two hours until our young charges are turned over to the butcher. Let it be done by the clock; you will then be more regular and can more easily even up the day.

For the first week you are limited to rolled oats, millet seed (which is a semi-green food) and cracked corn, run through a Wilson mill to make it fine enough, then sifted to save the meal, which, of course, is wasted by throwing it on the ground. We have kept milk before them *all* the time and have carefully washed the dishes *twice* a day, noon and night, as nothing gets any more filthy than do these dishes if left uncleaned, the fat of the milk, dirt and droppings all adding their mite to make it so, more especially as the chicks get older. Some think skimmed milk expensive to feed, but after trying it you will be convinced that the increased growth that comes from feeding it, gives you a good profit on it, and this is what we should always think of when weighing the cost of food. The real question is, can I get enough quicker growth by using it and give me a profit on it? For feeding choice "fancy" chicks I have heard it contended that whole milk was cheap to feed. I have been able to buy all the skimmed

milk I want for 5 cents a can, of 8½ quarts to a can, and have used as high as twenty-six cans a day for broilers and roasters.

As we have put into each hover about one hundred chicks, we must see that the sand is carefully scraped off the top as often as necessary, probably twice the first week, which will be increased each week until about the third, then we commence to clean them regularly every morning. We run the wheelbarrow into the walk and lift the hover, which is hinged against the partition so it is easy to get at. We take a small dust pan, or, if you prefer, make a scraper by driving nails through a stick something like a rake, only close together. Then scrape or rake the *top* off, going quickly from one to another.

For the first week we keep the board in the sides just forward of the hover, as stated before. Now the second week we will remove it and keep an eye on the chicks to see that they do not get lost and by staying away from the fire too long get chilled.

For this week we will feed about the same, only perhaps it will be well to try them on a little mash made up of one-third corn-meal and two-thirds wheat bran, seasoned with salt and red pepper, just the same as though we were to eat it ourselves. Mix well and add boiling water. *Don't* put in enough to make it *sloppy*. Allow it to stand a short time, then feed. Not much will be eaten, but they will get so before the end of the week that they will look for it, as you feed your soft and hard grains alternately.

The third week we always settle down to our regular routine, to be continued until about ready to market. During the second week we have cracked some wheat in our mill, so have had that for an extra dish and a change, giving corn as a last feed generally. A good many feed cut or pin-head oatmeal to little chicks. This we have found to be a trifle pasty or gummy, and have dropped it, as more will get stuck up around the vent when this is fed than when not.

There is one thing that is absolutely imperative—that is, *to get your chicks out on the ground*. If it is bright and warm put them out for a few minutes when a week old. Don't let them stand "humped" up and shiver but make them hustle around by driving or feeding a handful of millet seed. After the second week they must go out *every* day unless it storms, *no matter if it is zero weather*. After you have tried it you will see how essential it is, for you will not keep them *on their legs* under such high feed in any other way.

As we enter upon the duties of the third week we will now get our routine started and will see the chicks push along for the next five weeks, at which time we hope to see two pound birds ready for the market, and get sight of the returns for our labor. The first thing in the morning is a feed of hard grain; then comes a feed of chopped raw potatoes. As the chopping knife and tray were too slow, we got an Enterprise mince meat chopper, had a new disc made with larger holes, about three-eighths of an inch in diameter, and ran the potatoes through that, catching in a pan the first and last to come out as it is nothing but water. The other is the pulp. Now take their food dish and give each pen all they will eat. A little later we throw in a little cabbage, cut in strips, which they will seize and chase each other around for until it is all eaten.

This constitutes all the green food they have, except once in a while we may substitute onions in place of cabbage. We have gotten our mash made for the day, and as 9 o'clock has come we will give our first feed of it for the day, only feeding what they will eat *quickly*. We feed on tin plates, about fourteen inches in diameter and a quarter of an inch deep, with a wide fold at the top. These can be readily cleaned preparatory to another feed by scraping with the feeding shovel, which is a small shovel about four inches across made of heavy sheet iron and a white iron handle. We have a pan to put the leavings in, if any. They go into the swill for the pigs. At

11 o'clock another mash, then the dishes are picked up, taken into the kitchen or cook room and washed.

Again at 1 and 3 o'clock we feed the mash and if we have used good judgment we have had a hungry mob each feeding. If we have been liberal, we find they have left something each time and are not ready for their food. When this is so just scant them until they clean up each time and do it *quickly*, taking care you have enough for all. You will find the number of plates will have to be increased, as the chicks increase in size, in order that each may have a chance. At 5 o'clock or before dark throw down a liberal feed of cracked corn.

We follow this bill of fare for about four weeks. As we have crowded the chicks pretty well, by putting one hundred in a pen *we must take extra precautions against filth*. At about four weeks of age a day's droppings are considerable on the floor of the pen, so the floor is now raked over each day and the collections wheeled out. For this we must use a loop-toothed rake.

We have by this time found our fountains small and easily tipped over by the chicks, so we have adopted new ones holding nearly two quarts, made of galvanized iron and cone-shaped on top to keep the youngsters from roosting on them, and instead of the saucer we use a small deep agate pan, only a trifle larger than the fount. This we find to be very satisfactory as the chicks can not put their feet in it.

To come back to the six or eight-weeks old chicks: We must now think of finishing them off. We examine them, weigh a few, calculate how much flesh can be made on them in about ten days, for as broilers, Boston has no use for anything over four pounds to the pair. We have fed so much bran that as we lay back the feathers on the breast we say, "they ought to have more color." How can we get it? We cast about for a way to get this. We know corn will do it, but we lose time if we drop off from soft feed to hard. The chicks won't grow as fast and we must turn them off as soon as possible to get the most profit from them. So we put into the mash all the cotton seed meal we can stir in and not make it "salvy" or "pudding," as we call it. With a little treacle added we have accomplished the result.

We now have a fine yellow skin if we have not foolishly chosen a blue blooded carcass, but any yellow-legged variety will succumb to the treatment. I would caution you against trying to feed this for too long a time, say more than two weeks, as the chicks will get cloyed by it and you cannot hold their flesh, to say nothing of making any, unless you can keep their appetites "up to the clip." This being such a high feed, it seems to become nauseous to them. One would find it difficult to keep them on their legs if it were fed from the first.

We have now "forced" the birds for eight weeks and have obtained what we set out for, viz; Two pound broilers at eight weeks.

This has been successfully accomplished on our farm here, with White Wyandottes. We have not done quite so well with any other variety. As I stated in my preceeding article, they will stand on their legs when Plymouth Rocks would be rolling on their sides with the same food.

We put up two pens of 110 each, and at eight weeks they weighed two pounds each, and a portion two and one-quarter pounds each under this system of feeding and almost the same treatment. By continuing the regular food we have made five and five-eighths-pound roasters at fifteen weeks old.

One thing more before closing: If you ship your poultry to market alive, and it travels twenty to thirty miles on the railroad, feed the night before, not too heavy, but some, as the birds will empty themselves in the night and on the journey. Give them *all* the water they will drink before they start on their funeral ride. You will thus save a portion of your shrinkage to nobody's injury, but to their gain, I believe, as

you help retain the juiciness of the flesh. Some of these hints have been gained in the expensive school of experience, but if any earnest, honest poultryman can get anything of assistance from them he is welcome. As one word of caution, do not attempt to raise your breeding females under such hot-house methods, because you will surely sacrifice your size through early maturity, as after a period of forcing as given above it is no uncommon thing for pullets to

lay at sixteen weeks, and we all know that is enough to stop growth. You may start your breeders in the brooder, holding off forcing foods, but get them out as quickly as possible.

The summing up of the discussion is, breed, feed and care. Let us not disdain to use the breed because it may be bred to "fancy points," as the fancy has given us our best and most practical varieties, and the nearer a typical bird we have almost any breed, the better carcass we have.

ARTHUR G. DUSTON.

POULTRY FOR MARKET.

Explicit Directions For Selecting, Killing, Dressing and Packing Poultry.

BY PHILIP QUIGLEY, PHILADELPHIA, PA.

PHILADELPHIA, March 19, 1898.

From the first of March to the first of November poultry should be shipped alive, or if shipped dressed should have sufficient ice in the barrel to prevent it from spoiling in transit. It would be safe to ship dressed poultry from November to March without ice, as during that time the temperature is lower.

Impress on shippers the necessity of permitting the entrails to remain in all poultry and game, with the exception of rabbits and venison; the entrails should be removed from the latter two animals.

I have had three shipments of Light Brahma cockerels from Mr. E. H. Upson, of Wilmet, Ind., and got him thirteen cents per pound.

We charge five per cent for selling goods and deduct the expressage, etc. Thus:

1,000 pounds, 10c.....	\$100.00
Less express.....	\$10.00
Commission.....	5.00
Net proceeds	\$ 85.00

EXPLICIT DIRECTIONS.

SELECTING.—Select nothing but well-fattened stock. Full crops are undoubtedly a great injury to poultry, and often taint the whole fowl, giving it a sour, bad flavor; besides, if it is kept from food twenty-four hours before killing, the food becomes fully digested and, having passed off, leaves the entrails comparatively clean.

KILLING.—The best mode of killing fowls is to stick them in the mouth, being careful that they bleed freely, and that the blood does not collect around the head, causing that part to spoil much quicker than it otherwise would. Pick the feathers while the fowl is bleeding and be careful not to bruise or tear the flesh.

DRESSING.—Poultry should be dry-picked, not scalded. They should then be hung up by the legs or spread upon shelves in a dry place, but not in a draft where they will become "wind-dried." They should not be packed until the animal heat has had time to escape. Care should be taken not to allow them to freeze before being packed, and it is much better to reach market free from frost. The head and feet should be left on; they should be well cleaned, but the intestines should not be removed.

PACKING.—Barrels should be used for packing all kinds of poultry. Pack as compactly as possible, always lining the barrel with clean paper, and see that the package is so well filled that when the cover is on the contents will not be shuffled about in handling. Never use straw in packing poultry; for, besides creasing their bodies, there is always more or less chaff, which detracts from the appearance of the fowls.

Yours truly, PHILIP QUIGLEY,
Commission Merchant.

Persons living as far west as Omaha have shipped dressed

poultry to Mr. Quigley, while numbers of them living in Illinois, Indiana, Wisconsin and Ohio do so every year. When the Philadelphia market prices are two cents per pound higher than western prices, it pays a small profit to ship to Mr. Quigley. The two cents extra will pay the freight (ship in refrigerator cars by through freight) and leave a small margin. When there is more than two cents per pound difference in the prices all in excess of the two cents is clear gain. Said Mr. Quigley: "I have never yet had a spoiled lot of poultry shipped in here from the west. Dressed and packed as we advise and shipped in refrigerator cars it arrives here all right. It really pays best to ship all poultry dressed, for then there are no losses from deaths en route, there is no shrinkage, and where poultry is shipped long distances by freight it is almost necessary to ship it dressed. It is better, much better all round."

The first four months of the year Mr. Quigley handles an average of 1,500 pounds of poultry per week. This past season he has received from the west a large number of capons. The neighborhood of Fairbury, Ill., has sent him a good many. For these he paid sixteen cents per pound at a time when cockerels of the same age were bringing only five to seven cents, seven cents being the highest price obtained for them during the season. A Mr. C. K. Cooledge, of Fairbury, Ill., makes a business during July, August and September of caponizing cockerels for farmers, these capons to be shipped to Mr. Quigley the following winter and spring when from seven to ten months old.

"The market," said Mr. Quigley, "prefers capons that weigh only six to seven pounds each. Big capons are really not popular. They run into money too fast to suit the average purchaser and the average sized family. The prices for capons range with us from twelve to eighteen cents per pound. We begin to have calls for them soon after Thanksgiving. About January 1 they sell at twelve cents per pound, in February at thirteen and fourteen, in March at fourteen and fifteen, and in April at sixteen to eighteen cents. You understand that capons fill in at the time of the year when they are the only kind of tender fowl people can buy. The turkey season has passed by, poultrymen will not sell hens at this time and there are no spring chicks in market. This creates a good demand for capons and sends up the prices.

"Furthermore, capons are very tender and juicy eating, so that persons who buy them once buy again and again. I am a firm believer in capons and advise poultrymen to caponize, especially in sections where range is plentiful and food cheap. It will pay them a good margin over what they can get otherwise. I would advise western people to hold their capons over until March and April. Food for them is cheap in the west and the increase in prices will yield a profit."—*From August, 1898, R. P. J.*

BUILDING AN INCUBATOR CELLAR.

Importance of Fresh Air—How a Cellar Without Ventilation Failed in Its Work.

BY ARTHUR G. DUSTON, MARLBORO, MASS.

I THOUGHT that I might say something to your readers regarding incubator cellars that might be of help to them—not that I can tell them the exact things to do to insure success, but rather tell them what *not* to do to insure failure.

I formerly ran my machine in a house cellar and had the average success. As I increased the number of machines, I saw that in order to obtain the best results it would be necessary to operate the incubators in a cellar built for that purpose, so in the fall of 1895 I began the cellar.

My lawn on the south and at the rear end of my dwelling sloped off abruptly about four feet. I purposed digging into this bank to the depth of two and one-half feet, thus putting the roof of the cellar on a level with the lawn. I laid it out running parallel with and adjoining the house, with a door leading from the house cellar into the incubator room. I put in a bulk head (a horizontal or sloping door) giving entrance to the cellar from the outside, constructed like a porch with the roof extending out, furnished with two sets of doors.

I had planned my cellar to hold eight 600-egg machines, two rows of four machines each, with an aisle between, and to my notion this plan looked elegant on paper. The walls I had constructed of stone two feet thick, laid in cement. The roof was made of 2x10 feet cross beams and 8x8 inch joists supported by three-inch iron pipe posts. For the covering for roof I used two-inch plank and on top of that tar paper. About an inch of concrete for the floor completed my cellar.

I started a machine or two, and the result was that in a short time all the oxygen in the room was consumed and there was no arrangement for a fresh supply. I sent for a practical man on the ventilation subject and he said he thought that a ventilator of about fifteen inches in draft, running up through the roof, with an opening at the top and bottom, and an equal amount of ventilation secured from the doors, would remedy all difficulty. So I went to work on his suggestion. The doors had a diamond shaped opening at the bottom, and as the outside door was too feet higher than the inside door, it prevented a direct draft. When the wind was from the north-east this plan of ventilation worked to perfection, so much so

that a handkerchief would go sailing up the pipe when held at the opening. But when the wind was from other quarters, the ventilation amounted to nothing unless I opened the door leading into the house cellar. Of course if the ventilator pipe were run up about fifty feet it would always draw, but I hesitated putting so unsightly a contrivance on my lawn.

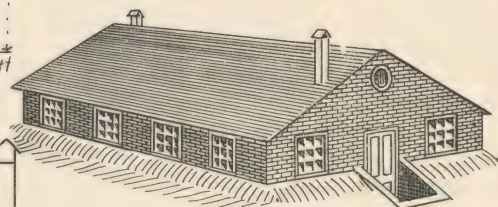
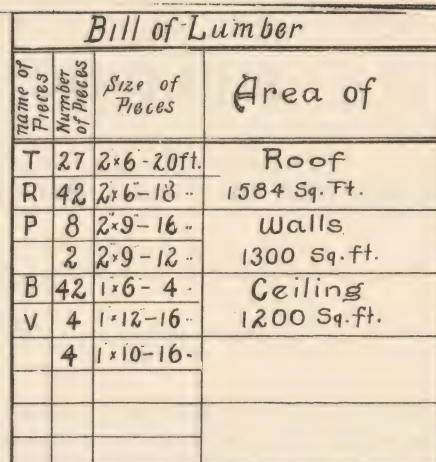
Well, I worried along all winter and did not get a satisfactory hatch during all that time. I did, I believe, get a pretty fair hatch in July, when I ran the cellar with all the doors wide open! I am not prepared now to say just what my hatches for the year averaged. I had new machines, a new cellar, and, suffice it to say that the broilers I was able to ship as a result of my work did not at any time cause a glut in the Boston markets. I do not, however, assign all my failure to the cellar. I know that last year was a bad one for fertile eggs, as I tested eggs bought from three different breeders and got the same results. I succeeded in raising enough birds for breeders, and made up my mind that before the machines were started again I should have something done.

In December of last winter I had a carpenter come out and raise the whole roof two feet, put in supports, paper and clap-board the outside and sheath up the inside. I put in a window on the north, one on the east and two on the south, which enable me to ventilate just as much or as little as I please. As a result of this arrangement, hatches made in this cellar now give the best of results. The windows are only common cellar windows and are hinged at the bottom, so they may be dropped as much as desired by means of a cord.

From my own experience, I firmly believe that a great proportion of the poor hatches to-day are caused by the poor air in cellar and incubator. I know that an egg in process of incubation must have fresh air just as much as a hatched chicken in a brooder must have fresh air, and I also know that a hen as well as an incubator can overdo the matter of incubation. Keep your machine clean, with plenty of fresh air in the room, and don't, I pray you, buy a machine that has not a good system of ventilation. When all these points are observed, I believe the common complaints will in a measure cease.

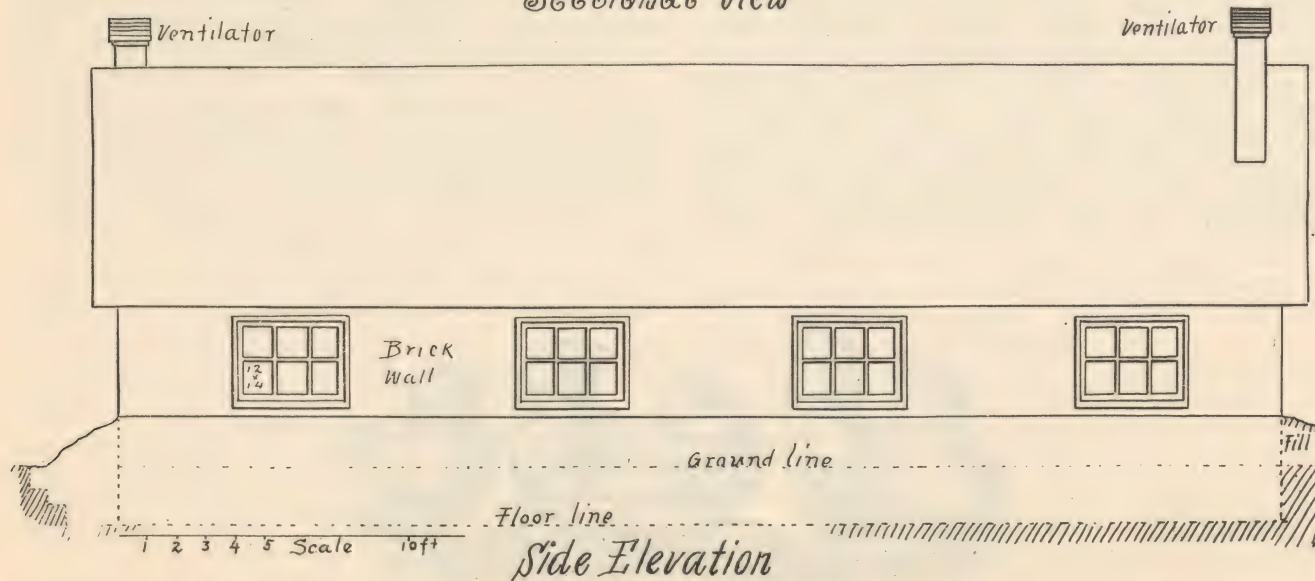
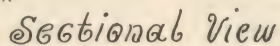
ARTHUR G. DUSTON.





Perspective
View

INCUBATOR HOUSE *DESIGNED BY*
PRAIRIE STATE INCUBATOR CO.
HOMER CITY
PA.



SUGGESTIONS ON BUILDING INCUBATOR CELLARS.

BY A. A. COOPER,
Of the Prairie State Incubator Company.

INCUBATOR cellars should be built, in a measure, to suit the climate. What would be a practical plan in the extreme north or middle states would not be suitable for the south. The builder should take into consideration the location of his incubator room. If in a light, sandy, porous soil there is no trouble to secure a dry floor, but in the ordinary soil, especially in a flat location, an incubator cellar should not be built very deep, but about like that shown in the plan, (see opposite page), that is, 18 inches to 2 feet, and the dirt that is taken out of the pit should be thrown back against the walls. This practically gives an under ground room with but little depth below the natural surface.

An incubator cellar is preferably covered with another story or at least a small attic. A second story is better, as it adds but little to the cost and is an excellent plan for storage room that is needed upon any poultry farm. On the duck farm this room is used as a feather curing room. The heat and warm air coming up from the incubator cellar aid a great deal in the drying and curing of feathers. Upon a chicken and broiler farm this room can be used for the storage of almost anything. The object of this additional story, or attic, is to prevent the heat of the sun from coming down into the incubator cellar.

An incubator cellar should be well lighted, and when possible it should be constructed so as to get the principal light from the north, so that at no time will the direct sunshine come into the incubator room. This should be guarded against, as a beam of light striking an incubator full of eggs will go through the glass doors and overheat the eggs. Of course this will not apply to incubators that are provided with an outside wooden door, but it is best at any rate not to allow

the sun to enter as it has a tendency to warm up the air. The best incubator room is the one that shows the least variation in temperature, and they should be constructed with this object in view. In a rolling country where a hillside can be secured, an excavation on the north side of the hill makes an excellent incubator room and has the advantage of not requiring any outside steps, as the door will open right into the room, and it is exceedingly easy to drain. No water can possibly stand on the floor. In a damp location the floor and walls should be cemented with the best cement, up above water level to keep out the dampness.

The ventilation should be well looked after. In cold weather all the ventilation required will be secured by the ventilators shown in the illustration. In moderate weather it may be occasionally necessary to use windows. They should be hinged below so as to open at the top and allow a free circulation without draft. In the south or in a warm climate, it is advisable to have a large opening in the ceiling extending out through the roof so as to produce a strong current of air.

Endless modifications can be made in the construction of incubator cellars. Either brick or stone may be used for the walls. The main point is to secure a uniform temperature and a dry room. Eggs can be incubated in an incubator cellar in hot weather when it is hardly possible to incubate them any other way, owing to the outside temperature rising too near the hatching temperature of the eggs, and it has its advantages in extremely cold weather, as an incubator cellar will not fall much below fifty-five degrees in extremely cold weather, and the result is it costs that much less to run the incubators, as not much oil is required.

A. F. COOPER.

\$2,347 WORTH OF CAPONS.

BY D. D. SHIRLEY, ALLERTON, IOWA.

It must be plain to any man in the poultry business, or one who is in any degree interested in the fortunes of those in the business, that the ultimate profits to the raiser must, as a rule, come from the production of poultry for food purposes, whether in eggs or flesh. The money laid out for choice breeders and fancy stock must first be derived from the sale of eggs or birds, or else from some source outside of the poultry business.

We do not mean to disparage those in the fancy raising business, but to call attention to the fact that it is the ultimate source of the returns we must look to. Improving breeds and breeders is a line always to be encouraged, but not to the exclusion or neglect of the fundamental fact that at last the final returns must come from eggs and carcasses.

To dispose at a profit of the cockerels which usually predominate in the hatches, has been one of the problems for the poultryman and one that he has not completely solved. Caponizing offers to him a new and fertile field of operation, one that will yield him great profits and whose hidden treasures can not be exhausted, as food is always a staple.

Heretofore in the Mississippi and Missouri valleys what cockerels we could not get to market at a fair price during the brief broiler season had to be sold as old roosters at one dollar per dozen, if we were lucky enough to get that much. By the process of caponizing one bird can, with less cost to the producer, be made to bring from sixty cents to eighty-five cents, and a dozen birds thereby be made to realize to a poultryman or farmer from seven to nine dollars. This is no crank poultry talk, it is cold facts. We have been doing this well in

this vicinity for four years. One buyer here paid \$2,347 for capons alone in the winter of 1896-7, in December, January and February. One farmer's wife that winter brought in one hundred capons that brought her \$90, and the next season she brought in one hundred and ten that brought her \$87.50. Caponizing has increased the profits of the poultry business enormously in this vicinity and our people are in the capon business to stay.

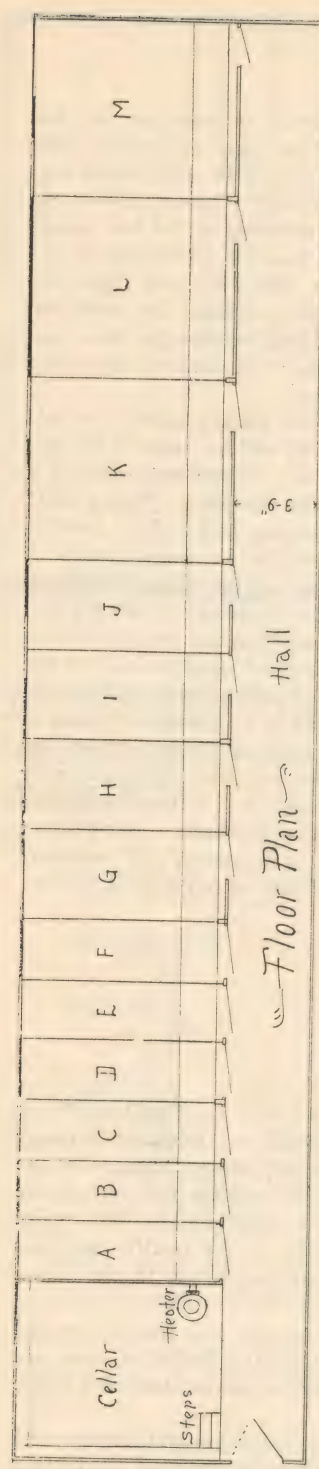
The operation, while requiring care, is a simple one and is being performed here in this locality chiefly by boys and women and they seem to be doing a thriving business in the caponizing season.

As the contention for profitable employment increases and economic conditions drive us to glean the fields of production more closely, all these byways and corners must be worked out and every means of profit brought into operation. From a practical point of view it is just as necessary to caponize a cockerel for market and table use as it is to steer a calf or barrow a pig when meant to be used for food, in order to get the best results in weights and in consequent profits.

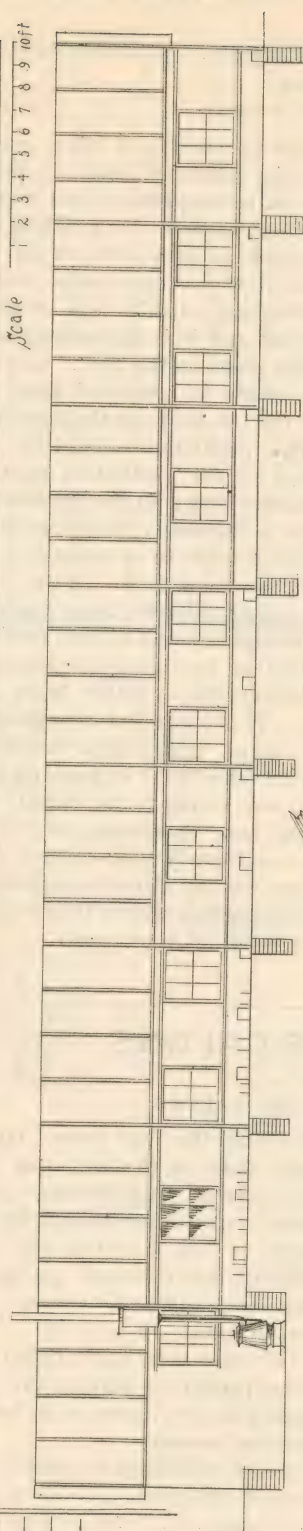
When we contemplate the prices that capons bring, ten to twelve cents per pound here at our own depot, when hens sell at from five to six cents per pound, the wisdom of caponizing must be plain to any one. If it pays to raise a calf to a steer or a pig to a marketable hog, it likewise pays to caponize and mature a cockerel. The poultry people in this vicinity are going to do their share this year towards pushing forward the western capon.

D. D. SHIRLEY.

BILL OF LUMBER			
LOCATION OF PIECE	NUMBER OF PIECES	Area	
R	34 2x4-11ft	Roof	
	34 2x4-8	1122 Sqr.ft	
T	34 1x4-8		
M	3 1x6-16	Walls	
	1 1x6-8	900 Sqr.ft	
Q	14 2x4-9	Partitions	
S	16 2x4-16	230 Sqr.ft	
	2 2x6-13		
	4 2x4-13	Brooders	
U	13 2x4-5	112 Sqr.ft	

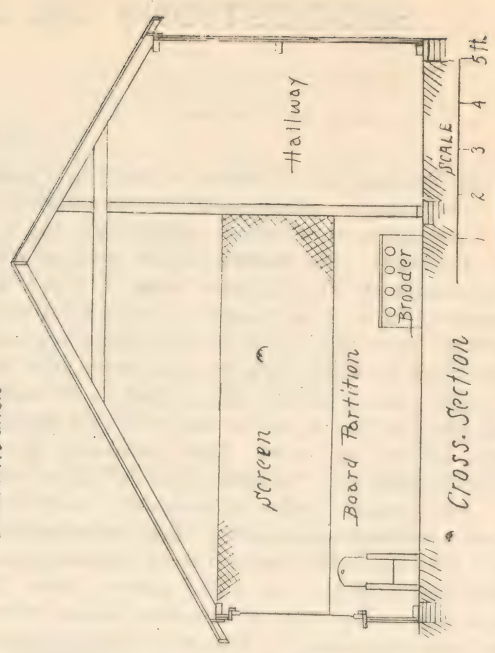
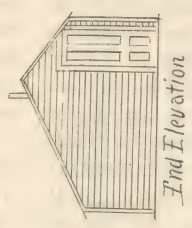
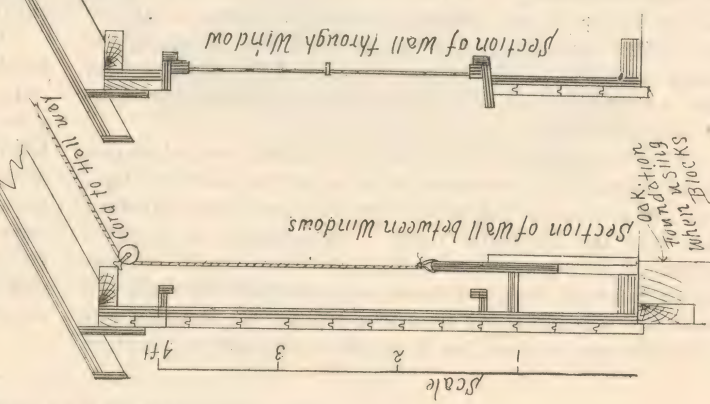
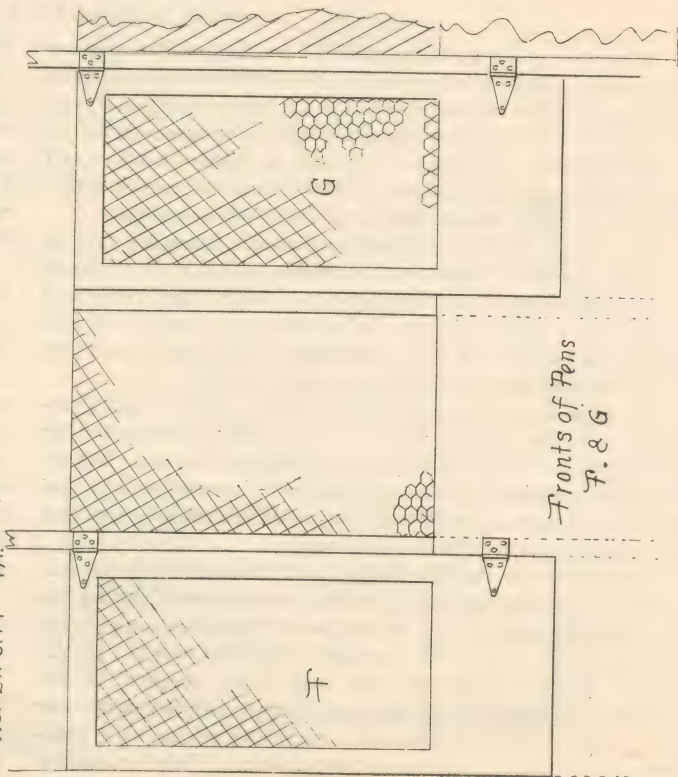


Scale 1 2 3 4 5 6 7 8 9 10 ft



Brood House
13 x 64 ft.
Capacity 1300 Chicks.

DESIGNED BY
PRAIRIE STATE INCUBATOR CO.
HOMER CITY PA.



CONSTRUCTION OF BROOD HOUSES FOR CHICKS.

ALL users of incubators and brooders in time feel the need of a properly constructed brood house, and should carefully consider in their plans the questions of convenience and ease of caring for the chickens, and should provide an arrangement that will enable them to raise the largest possible percentage and number with the smallest expenditure of money in first cost of building. A practical brood-house may be made of quite inexpensive materials. The plans and internal arrangements are endless. A few points only are essential and we will bring them up in their proper places.

Brooder-houses may be of any length, single or double. The usual rate of capacity is five lineal feet of brooder per one hundred chicks. The width of a single house should be thirteen feet and a double house twenty-four feet. A few feet more or less in width will make no difference. These are average widths.

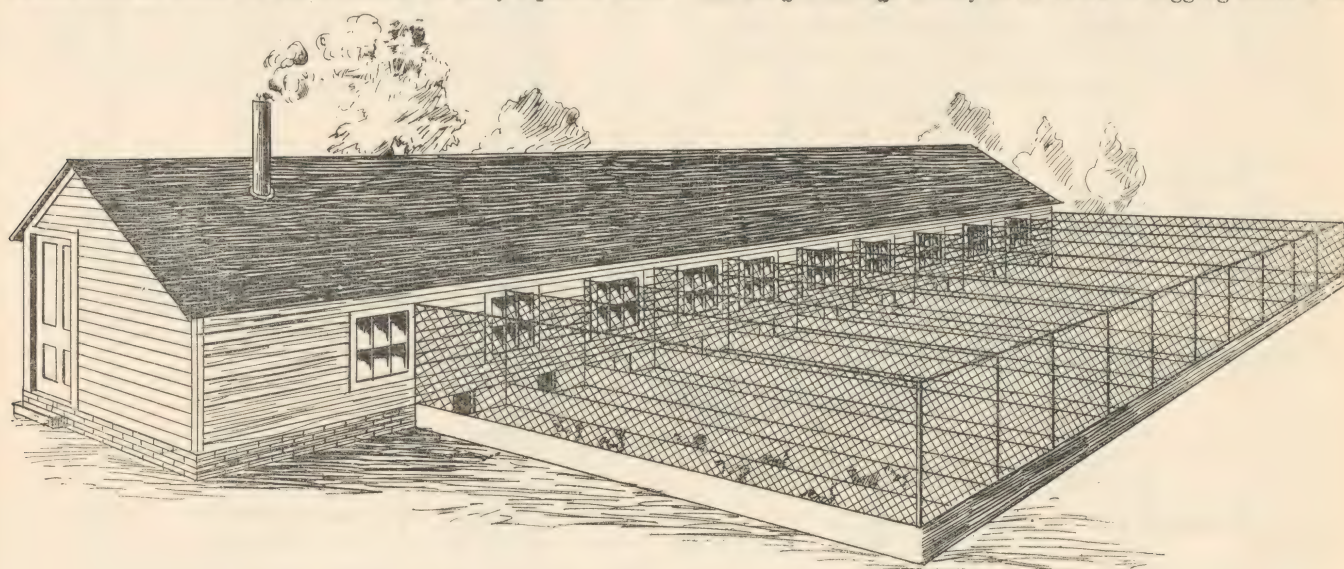
The alley, in either a single or double brood-house, should be of sufficient width for the attendant to carry a pail in each

the eaves of the south side, and along the center of the building there should be a verticle offset in the roof and glass put along it so that the rays of the sun will reach the pens on the north side.

VENTILATION.

No ventilation is needed in the winter time beyond that which is accidental. In the summer time the glass sash are opened and this provides all the ventilation required. This is one object in putting them under the eaves. In case they are opened the rain does not get in as it will when the sash are placed in the roof, if left open accidentally.

Foundations may be of brick, wood, or stone. Brood-house floors should be of earth, sand, or gravel, filled in at least six inches higher than the ground outside, so as to get a dry floor. In a sandy location when troubled with rats digging down under the foundation, if a one inch mesh wire netting, one foot to eighteen inches wide, is buried around the outside of the building, making an underground fence, it will keep the rats out. They dig down to this netting and as they can not get through it they never think of digging under it as



EXTERIOR VIEW OF THE BROOD HOUSE FOR CHICKS AS SHOWN ON OPPOSITE PAGE.

hand without having to walk sideways. This is a small thing but is a great aid in feeding and watering. In a double brood-house for broilers, the broods are placed on each side of the alley. A young duck does not require as much heat as a chick. A wire fence in a duck brood-house is not needed between the pens so that one heating system can be run through the center of the building and a walk made on top of the brooders. In making the alley on top of the brooder pipes, the width of an alley is saved from the width of the building.

The roof may be of shingles, slate, tin, or sheet iron. We do not recommend the use of paper, felt, or any of the composition compounds for the reason that they are frequently blown off during storms and the chicks get wet and chilled, and the whole brood will be lost in consequence.

The height of a brood-house should be low to save heat and bring the heat down near the floor where the chicks stay. A low house is the easiest to heat. A building should be just high enough for the attendant to walk through, the alley being in the highest part of the building.

Glass should never be put in the roof; always under the eaves. Ordinary sash can be used, made to slide or swing so that they can be easily opened in the summer time, the outside of the windows being covered with wire netting to keep out animals. In a double brood-house, when the building stands north and south, the glass should be on both sides; but in case the building runs east and west, the glass is put under

they would a board or a solid foundation. Walls may be constructed of rough boards and batten, or tongued and grooved boards, as the fancy of the builder dictates. The inside, if made of single boards, should be lined with paper, and if of double boards the paper should be put between. The object of using paper is to make the building wind proof. This is something that should be done.

Inside the house the partitions between the various pens should be constructed of fine wire netting, as laths or a solid partition darken the building too much. In the winter time the sun is low down and strikes the windows obliquely, and by having the partitions made of wire netting it allows the light to go through.

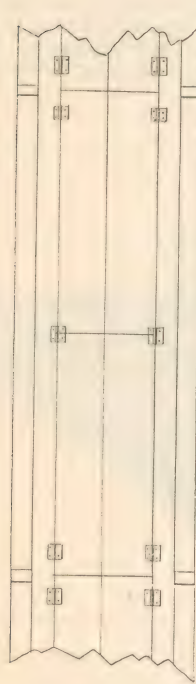
Your brood-house now having a dry earth floor, glass under the eaves, air-tight walls, and a water-proof roof, the next essential is a good brooding system. In a small brood-house sectional pipe brooders may be used, but on a large scale the hot-water pipe brooders, burning coal, or a combination of both systems should be used. The end of the brood-house should contain a shallow cellar or pit for the heater, the depth of this pit depending upon the size of the heater, running from twenty to thirty inches in depth. Around this heater can be arranged feed bins, a place for coal, or any of the various utensils and labor-saving devices that the attendant uses in his work, making the house convenient and not adding to the cost in any way.

See diagrams, presented herewith of brood-houses for chicks and ducks, also double-loop pipe system and houses in which sectional brooders are to be used. All diagrams are drawn to scale, are carefully lettered and accompanied by bill of lumber, hence should be easily understood. Any carpenter can make an accurate estimate of cost of same, and can build the house.

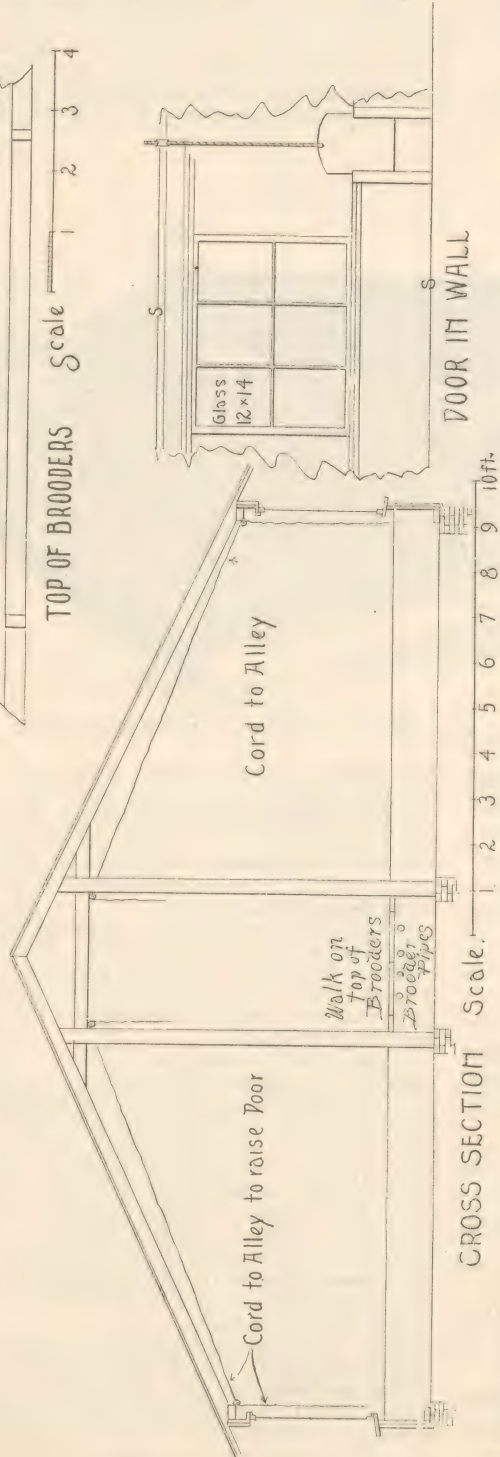
A. F. COOPER,

Brood House 20x104 ft *Capacity 2400 Ducks* *Designed by Prairie State Incubator Company* *Homer City Pa.*

BILL OF LUMBER				
LOCATION	NUMBER OF PIECES	SIZE OF PIECES	Area of	
R	106	2x4-12ft	Roof	
W	13	2x4-16"	2544 Square ft	
T	50	1x4-7"		
M	6	1x6-16"	Walls	
Q	24	2x4-9"	1256 Sq ft.	
S	26	2x4-16"	Partitions	
S	4	2x4-12"	516 Sq ft.	
	4	2x4-9"		
	2	2x4-16"	Brooders	
			Top and Sides	
			480 Sq ft.	



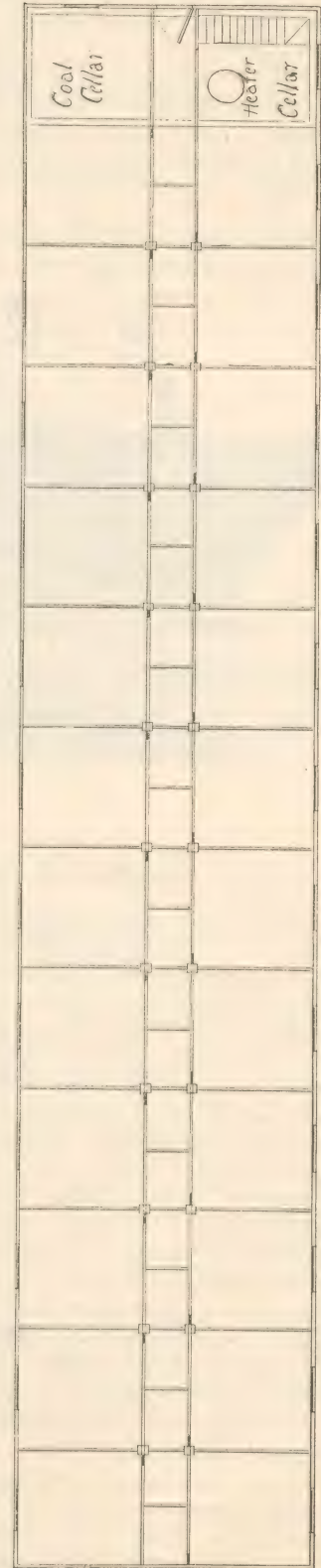
TOP OF BROODERS Scale 1 2 3 4



CROSS SECTION Scale 1 2 3 4 5 6 7 8 9 10ft.

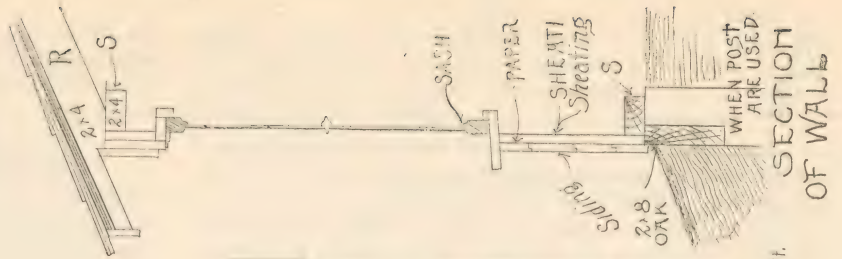


Side Elevation



FLOOR PLAN

Scale.



SECTION OF WALL

CONSTRUCTION OF BROOD-HOUSES FOR DUCKS.

BY A. F. COOPER,

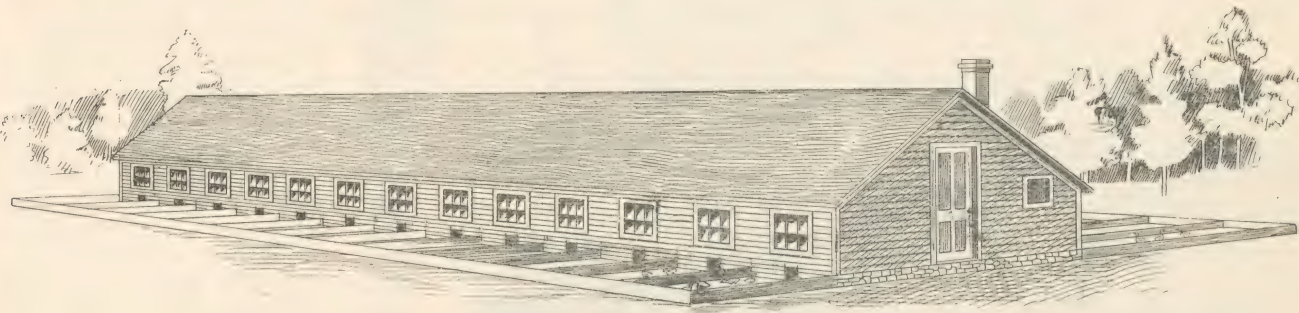
Of the Prairie State Incubator Company.

A BROOD-HOUSE may be built exclusively for the raising of chicks, it may be built for ducks alone, or it can be so constructed that either chicks or ducks can be raised in the same house, but, as a rule, a duck brood-house, such as is shown in the illustration, is not adapted to the rearing of broilers. Ducks do not require a hover; in fact they will not go under a hover. The curtain is dispensed with in a brooder for ducks, the pipes being covered with boards only. The pipes are also placed farther apart and higher from the ground.

Ducks are not raised in extremely cold weather, so the

or vacuum feed troughs, but in a box containing small stones. The ducks can get their bills between the stones and drink the water, thus preventing them from spooning the water out and wetting their feathers, a practice that has to be guarded against.

Glass may be put in the eaves or roof of a duck brood-house, but preferably under the eaves as this gives a more uniform temperature in the house, and in the summer time the glass may be removed and its place filled by a frame of wire screening. Ducks do not require brooding as long as chicks. They use a warm brood-house for four to five weeks



EXTERIOR VIEW SHOWING DUCK HOUSE RECOMMENDED AND DESCRIBED HEREWITH.

concentration of heat is not essential or desirable for young ducks, and for this reason the pipes are placed from eight to twelve inches apart and from eight to twelve inches from the floor, and to save room in the double brood-house a walk is often made (as shown in the illustration) over the tops of the brooders.

The high board partitions, wire netting, etc., are not required in a duck brood-house, the partitions consisting only of a board about twelve inches wide, stood on edge. This is all that is necessary and will pen a duck until entirely grown, as they make no effort to get over an obstruction of this kind.

A duck brood-house may be constructed single or double. When the single pipe system is used the alley is located on one side, but in a great number of brood-houses built on the double plan the alley is placed down the center with the pens on each side.

A dry floor is preferable in a duck house, yet it is not so essential as in the chick brood-house. The majority of duck brood-houses contain simply sand floors. This sand is sometimes covered with hay, corn fodder, or almost any kind of litter, which is removed occasionally as it gets filthy. Feeding boards are provided, and they are watered not in open troughs

and from this they are transferred to a cold brood-house, having no artificial heat whatever.

A cold brood-house is easily constructed upon the single-row plan about thirteen feet wide, and similar to the plan that we show for a broiler house. The only internal arrangements, however, are board partitions about every ten to twelve feet, to separate the different pens, no alley, brooders, or anything of the kind being required, simply a building with a twelve inch board partition inside to correspond with the pens outside. The ducks are kept in the cold brood-house until ready for slaughter.

A cold brood-house is not illustrated in the drawings given herewith, but by constructing one upon the plan of a single broiler house, without any of the internal arrangements, it makes a very good cold brood-house for ducks. In localities where the soil is sandy no foundation, whatever, is required, the house being set simply upon posts and constructed in the cheapest possible manner, the walls wind-proof and the roof water-tight being the only essentials. After the ducks are six or seven weeks old, in moderate weather and summer time, a cold brood-house is not even provided with glass windows, being closed simply by screening.

A. F. COOPER.

RAISING CHICKENS ARTIFICIALLY.

BY A. F. COOPER,
Of the Prairie State Incubator Company.

It is an old saying that the hatching of chicks is one thing and the raising of them is another. It is our object to explain here in as few and plain words as we can, how to raise chicks artificially. In the first place, good brooders must be used. There are various makes of brooders on the market that, with proper care, will no doubt brood chicks up to the age when no brooders are required. A poor brooder is worse than no brooder at all, and it is, therefore, very important that a good brooder or a good pipe-system be secured, one that can be controlled by the operator. A brooder that will fluctuate in temperature, running too high and too low, is not a successful brooder and chicks ought not be entrusted to it.

The brooders that we have selected with which to illustrate this write up are of our own make. We have used the same merely to illustrate and make plain to our readers how

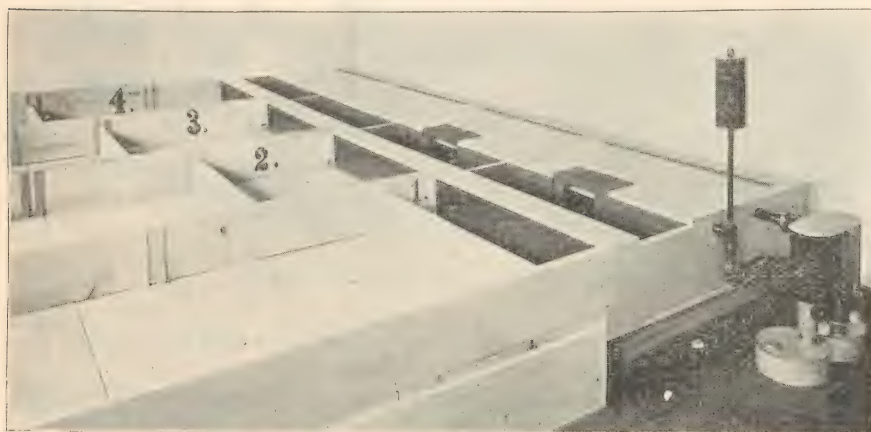
They must be enclosed in small quarters at first to teach them to run back and forward under the hovers. From day to day these yards can be extended by simply moving the partition as shown in cut, and by the time they are a week old, full yard space can be given them and in this way a much larger percentage of the chicks will be raised. A great many persons who are trying to raise chicks artificially, allow them to get chilled in this way, by giving them too much room at the start, hence they imagine that the brooder is at fault or they are not giving the proper foods, or perhaps they are at fault, when it is really innocence on the part of the operator because he did not know how to train his young chicks where the hovers of the brooders were in order to obviate their taking a chill.

On a large scale, where the hot water stove and pipe system is used, and where the capacity is rated up anywhere from four to six thousand, the same care must be taken, although in our experience we have not been able to raise quite so large a percentage, as the stove and pipe system will fluctuate in temperature much more than the smaller brooders heated by lamps. A properly constructed brooder, heated by lamps, is the only safe brooder, so far as our experience goes, that young chicks can be entrusted to. If proper care is taken of the lamp brooders they can be operated within a very few degrees of an even heat. This is very important for the young chicks, just as important as it is to hatch them properly, and if the heat fluctuates up and down, which it will more or less when a large stove and pipe system is used, there will be a

considerable death rate among the young chicks.

We should like to impress upon the minds of our readers that if you are engaged in the business on either a large or small scale, it is better to use a few lamp brooders, at least, in connection with the hot water stove and pipe system, using the lamp brooders as nurseries until the chicks are about three weeks of age, then transferring them under the larger pipe system. The fluctuation in heat will not then affect the chicks, for on account of their having some age, they can stand the fluctuation in the brooders, as well as in the brood-house. With lamp brooders the operator knows, after a few days of operation, about the amount of blaze necessary to produce sufficient heat for the young chicks, hence in the winter months when the after part of the night is always the coldest, with these lamp brooders you have just the same temperature in the brooders in the morning as you did in the evening.

Where the large pipe systems are used exclusively the death rate among chicks has been heavy; in fact, many persons who have gone into the business on a wholesale plan have almost pronounced this plan a failure. The hot water stove will produce sufficient heat to raise chicks, irrespective of the weather, but unless a night watchman is on duty in order to keep up the fire in the stoves, the fire will burn down towards morning and the brooders and brood-house get cold, hence the chicks become chilled, and, as stated above, the death



FIGS. 1 TO 4—SHOWING SECTIONAL BROODER READY FOR USE.

to care for their chicks after placing them in any good brooder. The cut shows a No. 4 Sectional Brooder, and is no different, in one sense of the word, than a brooder constructed under the hot water stove and pipe system. The photograph of this brooder was not taken in a brood-house, but the brooder is shown fixed up as it should be under perfect control of the operator so as to govern his chicks when first placed in the same.

In Fig. 1 it will be noticed that a partition runs across the yard in order to keep the young chicks near the hover. The same in Figs. 2, 3 and 4. In partitioning the yard off in this way it keeps the right young chicks from venturing out into the yard too far so as to get chilled. It will be noticed that the flaps of two of these brooders are in part turned up. This is to teach the young chicks very quickly where the hover is, and if any one using brooders will follow these directions, a great many of the young chicks can be saved. The difficulty with a great many persons trying to raise chicks is, they let them get too far away from the brooder proper when they are very young, hence the chicks take a chill and it is a difficult task to get them over it.

It makes no difference what the size of the brood-house may be. Great care and attention should be taken not to allow the chicks to get out to the side of the building where the light is (which they will invariably do if given their own way).

rate is heavy. This trouble can all be obviated by using the lamp brooders that can be operated under control of the operator.

A good, warm brood-house is absolutely necessary, in which a temperature of about sixty degrees should be carried. Cold brood-houses are not a success, and if the surplus heat from the brooders or pipe system is not sufficient to keep the brood-house warm, then other heat should be provided. It is no little task, nor do we think it a hard task, to raise chicks successfully artificially, but the proper appliances must be secured.

The temperature in brooders for young chicks when first taken from the machine should be about 95 degrees. Later it should of course be lowered from time to time according to the age of the chicks. With a proper temperature under the hovers and 60 degrees in the brood-house, with proper feeding and care ninety per cent of all strong chicks hatched can be raised.

FEEDING BROODER CHICKS.

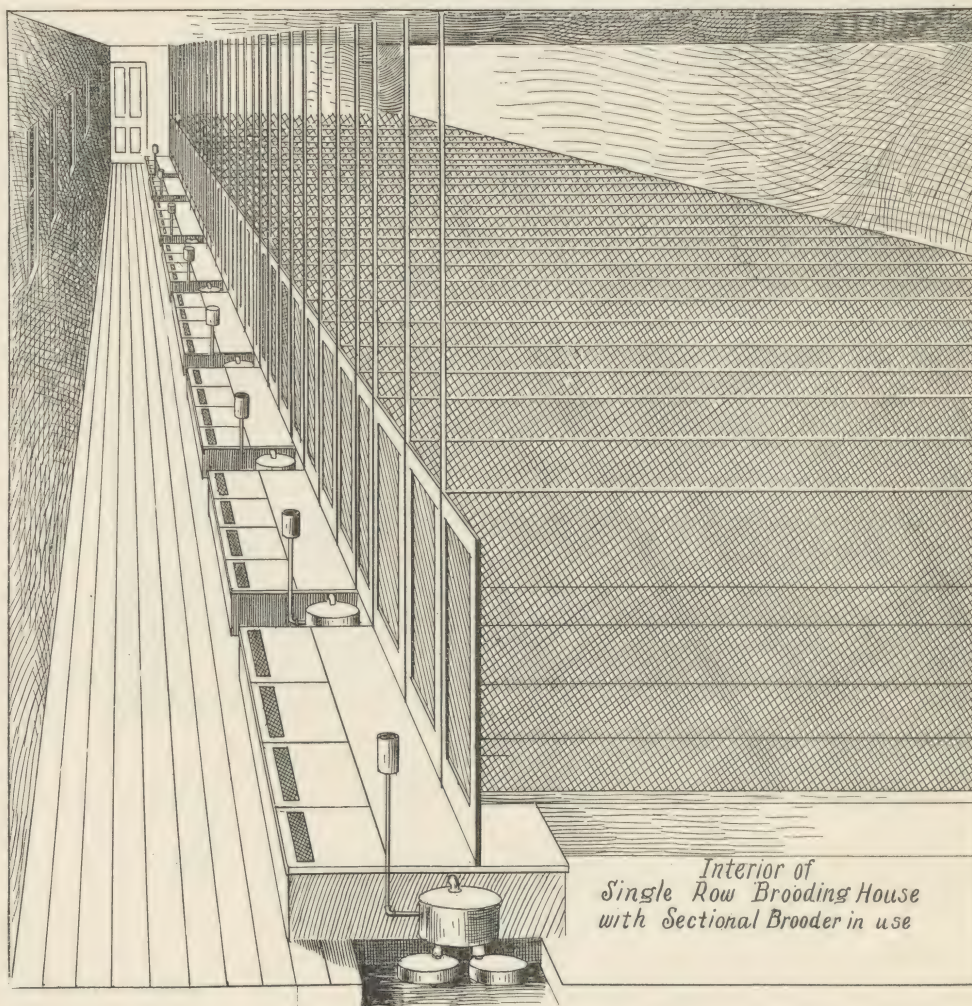
Avoid feeding sour food at all times, and never feed more than they will eat up wholly at each meal. If too much food is given them and it is allowed to remain in the food troughs, it becomes sour, and bowel trouble is the result. We are strong advocates of cooked food for young chicks, and have obtained very good results by simply feeding corn, oats and wheat ground together bushel for bushel. For young chicks it should be ground fine, and as they grow older, coarser food of the same ingredients can be used. For very young chicks we pour scalding water on this food, just enough to mix it up well and not be sloppy. The scalding water will cook the food and the chicks will eat it with a relish.

Another good food is a baked food, using corn-meal. Bake it the same as you would a pone, seasoning with a little salt. With the dry method, start off with a little rolled oats. We prefer either of the above foods, but the pin-head oat meal is a good thing for young chicks, feeding it in the litter. In this way the little fellows will scratch for it and it will give them plenty of exercise. We are also strong advocates of plenty of fresh meat for young chicks, commencing to give it to them when they are two days old, gradually increasing the amount as they grow older. It will pay any one raising chicks to feed them plenty of fresh meat, as it is bone and sinew to the chicks and gives them a good appetite, and we find that they grow much more rapidly when fed meat at least once per day when young, gradually increasing to two feeds per day after they get a little age. Be careful never to over-feed them on the meat, but just what you see they will eat up with a relish. Cut green bone is also recommended, especially if there is a liberal amount of meat adhering to it. In this case it will take the place of meat or meat meal. Green food may consist of roots, turnips, carrots, potatoes or chopped

cabbage. When starting to feed a new article of diet always give a taste the first time, gradually increasing the amount and watch the effect. In case the bowels become loose and need correction, use citrate of iron and ammonia, one tea-spoonful of crystals in one quart of water, in place of drinking water for the young chicks. Be sure you first remove the fresh water from them so that they will get a little dry before giving them this drink.

CARE OF BROODERS.

Brooders, as well as a hen house, should be kept clean, and where filth is allowed to accumulate in brooders it will cause sickness among the young chicks, therefore, the opera-



tor should make it a rule to clean out his brooder at least every other day. The bottom of the brooder should be covered with litter, cut clover hay, sweepings from the barn floor, or something of that nature. The floor of the brood-house should also be covered with the same material. It acts as litter for the young chicks to scratch in.

We advocate a ground floor in a brood-house where it can be kept dry, but in case the ground is wet then the only remedy is to cement the floor, and in case it is cemented it should be covered with sand not less than four inches deep, then throw the litter on the sand.

OUTDOOR BROODERS.

These are being used extensively throughout the United States to-day. We have raised chicks ourselves out of doors through the entire winter months, yet we do not approve of this plan as it makes a great deal of work for the operator and the greatest of care must be taken. In the early spring when the weather commences to get nice is the time to use outdoor brooders. However, the most successful way of raising chicks

artificially is in a brood-house. We realize the fact that some manufacturers of outdoor brooders will differ with us in our opinion, yet from practical tests and a careful study of this business for years we have had better results with the young chicks in brood-houses in the cold winter months. We manufacture outdoor brooders ourselves, therefore we are not writing the above detrimental to the interests of outdoor brooders. What we all want are the best results, and in the dead of winter it gets too cold for outdoor brooders, hence it is a poor place to raise young chicks. No outdoor brooder should be used in the early spring unless ample provision is made for the same. In connection with the brooder there should be a glass run made, or, in other words, such a run as some would term a "hot-bed," and on a rainy day or cold day, such as we frequently get in the early spring, the chicks will stay under this glass run in place of staying in the brooder. Of course they will run back and forward but this is all for the best.

On a visit to a plant sometime ago where they operated outdoor brooders, we were surprised to find that they kept their young chicks closed in the brooders the most of

able trouble to gather the chicks up at night and put them into the brooders.

FINAL ADVICE.

To any one starting in to produce fowls of any variety artificially let us say, judgment must be used. You must make up your mind to devote a certain amount of your time to it in order to bring about results. Volumes have been written and read, and to a certain extent have been of great value to the amateur, yet in the meantime, practical experience must be brought into play, and the operator must, to a certain extent, do some thinking for himself. Different locations require different treatment, and it is very difficult for any one to give desired information in this line unless full details are laid before him in order to map out the correct way. Fowls of all kinds are being hatched and raised artificially in the United States to-day with success, and we have tried in a limited space to give such information as we have found practical and have had many people adopt throughout the country who are putting their poultry plants on a paying basis. If you start in to raise chicks artificially and can not do so there is something wrong either with you or with the appliances that you have adopted to raise them with.

PREPARING BROILERS FOR MARKET.

In the first place sort out your chickens, as some run larger than others. Whether you ship alive or dead, sort them out, putting all the large ones by themselves and the smaller ones by themselves. If you have to kill your chicks, hang them up by the feet with a string. Make a sharp cut lengthwise in the mouth to make them bleed; then a slant upwards which penetrates the brain. Begin picking at once while warm, a pail being placed under the bird to catch the blood, and a hook fastened in the beak with a string and weight to keep the body straight and stiff. They should be pin-feathered at once. If the skin is torn during the picking it should be sewed.

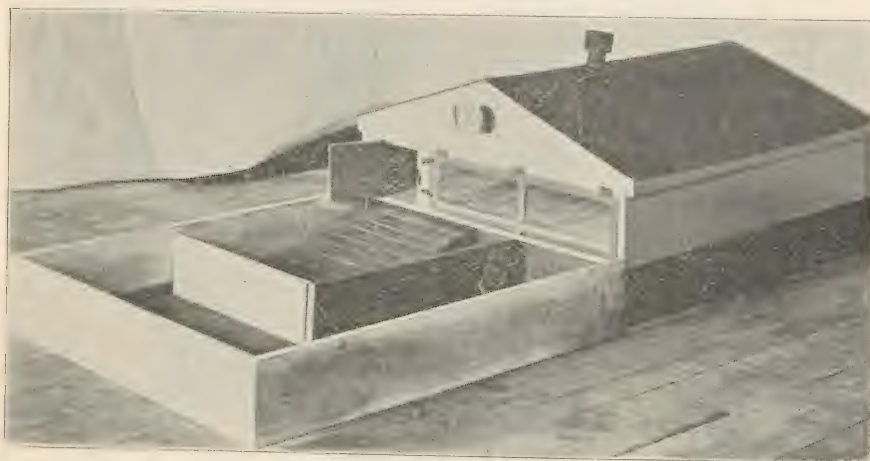
No food should be given for at least twenty-four hours before killing, as the crop should be empty.

After dressing, the fowls should be plunged into slightly salted water, ice cold if possible, and allowed to remain at least three hours, when they can be hung up on nails to drain. When fairly dry they may be neatly packed and are then ready for shipment. Always pack in boxes or barrels and ship by express unless otherwise ordered. In the summer months they should be packed in barrels to ship with a little ice. No straw, cloth, or paper is used.

The dry method of picking is the best, as these broilers invariably bring the best prices. Try as far as possible to be very careful in dressing fowls so that when the merchant receives them they are in good condition and he finds ready sale for the same. Do not ship anything for other people to eat that you would not care to eat yourself. Send them to market in the very best condition you possibly can, and you will at all times find ready sale for all the broilers that you can produce, whether by the dozen or by the thousand.

It is always best to write the merchant before shipping, then he will know just exactly where they came from and prompt returns will be made.

A. F. COOPER.



NO. 5—OUT-DOOR BROODER WITH SAFETY YARDS FOR SMALL CHICKS.

the time. They had no outside run for them and let them out very little through the day on account of it being disagreeable weather. Of course the chicks commenced to die, and the brooder got the blame. In connection with the outside yard covered with glass there should be a yard with wire stretched around the same, and on sunshiny days the chicks will run out there. After they become accustomed to their home this can be removed and the chicks will run at large, and if there comes up a rain at any time this glass run helps to make a protection for the chicks.

The caring for an outdoor brooder is no different from any indoor brooder. Litter should be provided to cover the bottom of the glass run and the ground floor. With the outdoor brooder we here illustrate, the reader will notice that there are two yards attached to the same. The small yard is intended for young chicks when first placed in the brooder in order to keep them from getting too far away. In this way the young chicks will run back and forth and soon learn where their home is after a few days, then it can be taken away and they can be allowed more room. By yarding the outdoor brooder in this way it saves all the trouble of gathering the young chicks up and putting them into the brooder at night. Where large runs are provided for young chicks at the start it is consider-

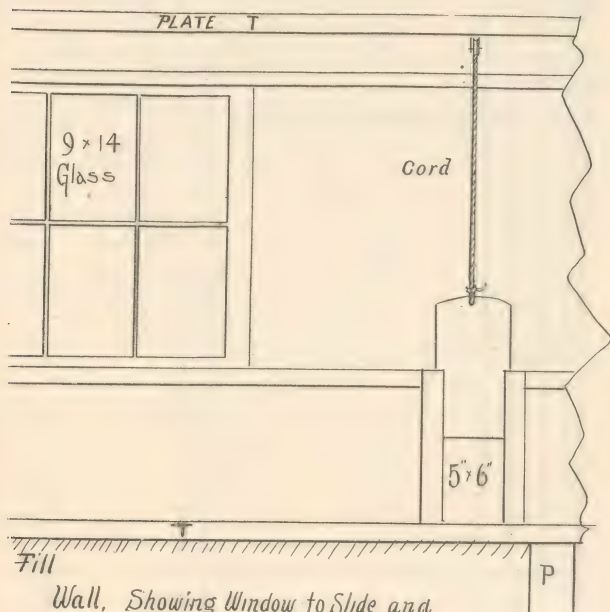
BILL OF LUMBER					Area of
R	9	2x4-8ft	Roof 230 Sq. Ft.		
S	9	2x4-5			
T	4	2x4-16			
T	4	2x4-10	Walls 300 Sq. Ft.		
A	1	1x6-16			
B	7	1x5-7	Partition 75 Sq. Ft.		
C	2	2x9-16			
C	2	2x9-10			
P	8	6x6-2			

Plan of House for Sectional Brooder

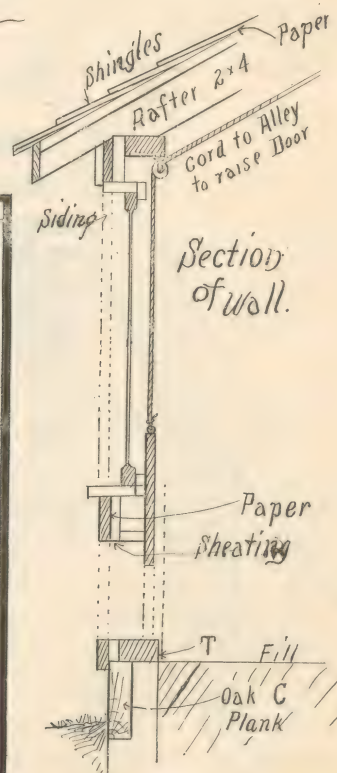
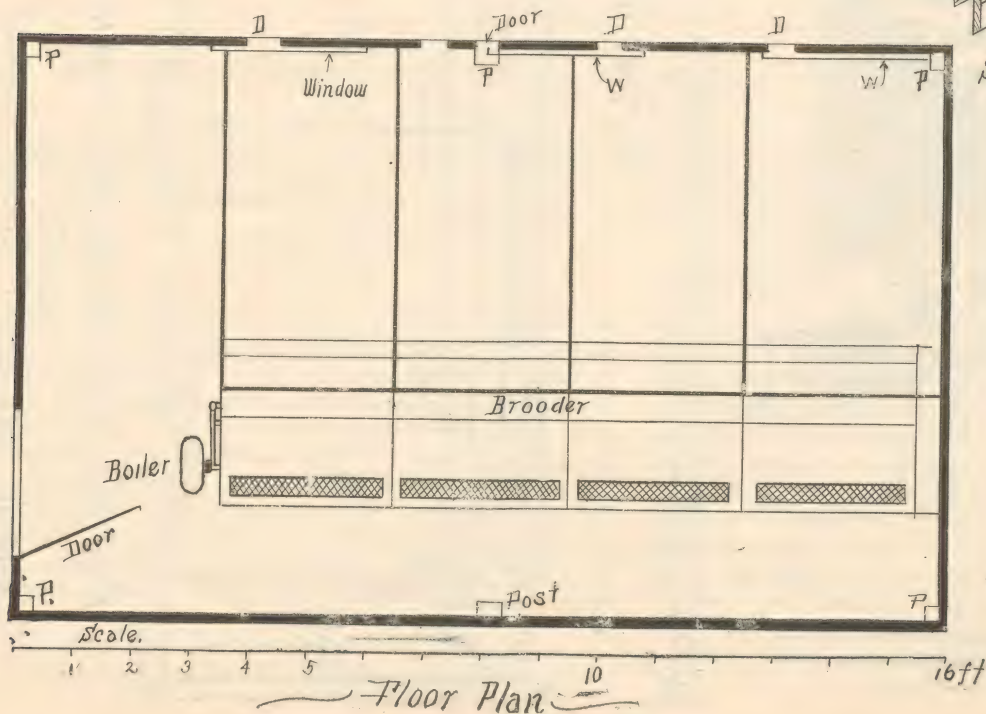
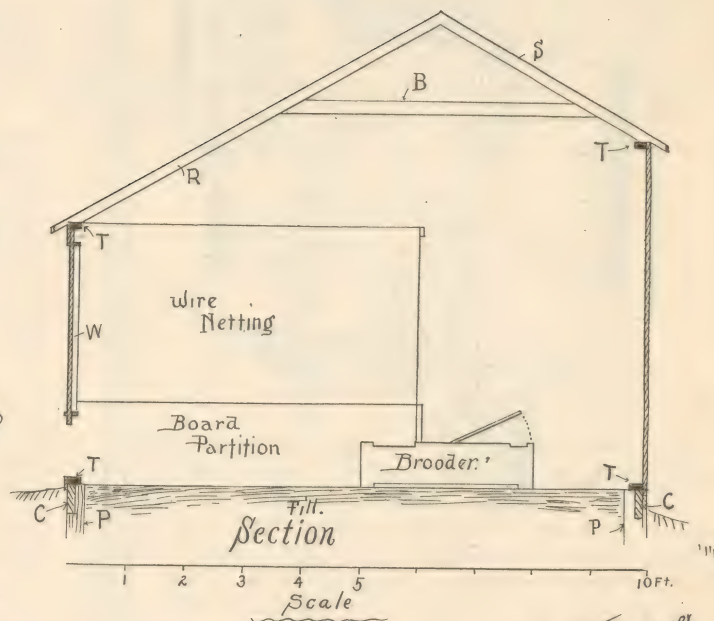
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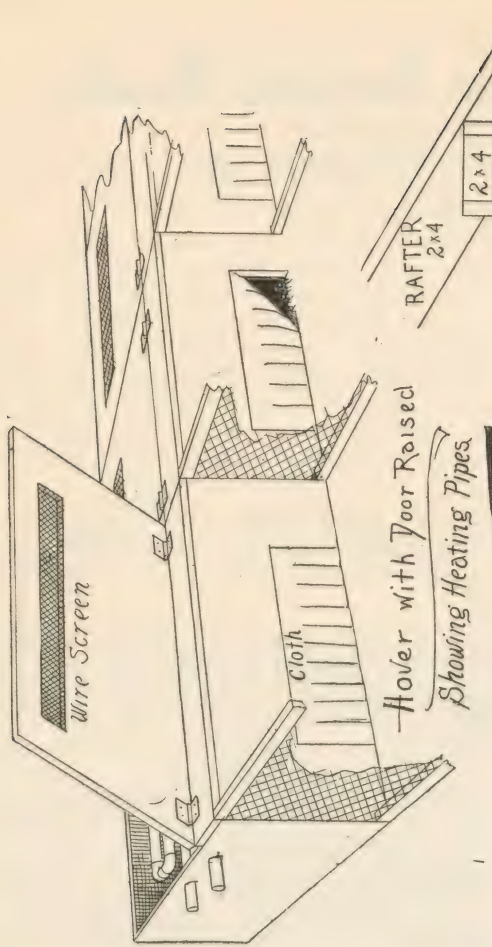
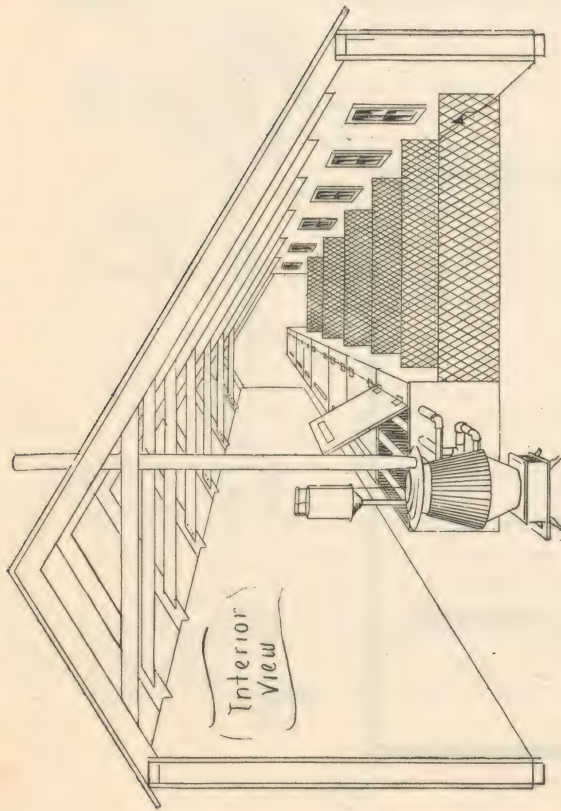
PRAIRIE STATE INCUBATOR CO.

HOMER CITY, PA.

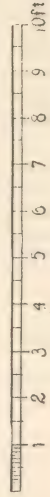
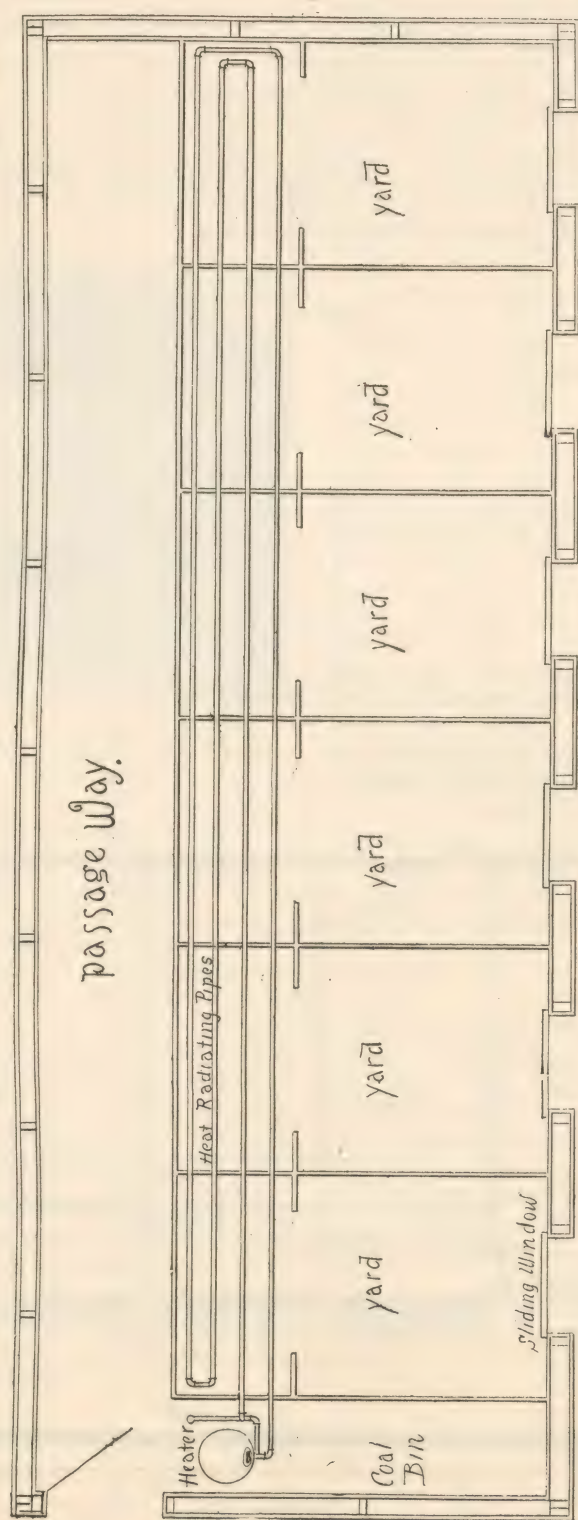


Wall, Showing Window to Slide and Raising Door with rope attached





Hover with Door Raised
Showing Heating Pipes



Floor Plan Single Row "RELIABLE" Brood House

DESIGNED BY
Reliable Incubator & Brooder Company Quincy Ill

SINGLE ROW RELIABLE BROODING HOUSE.

ON opposite page are shown drawings of the single row Reliable brooding house, a house that embodies the best ideas to date for a single row house. This house can be built in any length, the usual width being twelve to sixteen feet, sixteen feet preferred. This gives room for a four foot aisle along the rear wall of the house, for brooders two and a half feet in width and for inside yards or runs nine and a half feet in length. These inside runs can be built so that the yards may be increased in size to accommodate the chicks as they grow larger, or the number of chicks can be reduced. The latter is, perhaps, the easier plan, for then the brooders are all of the same length, but either plan can be used, as desired.

Elsewhere in these pages is shown an illustration of the hot-water heater with pipes attached. If a long brooding-house is built a double heater with pipes extending both ways should be used, for this places the heater mid-way of the house, thus bringing the source of heat nearer to the pens located in the ends of the house farthest from the heater. Where a short house is built, say one of fifty feet or less in length, a heater with pipes extending from one side only, will do very well. If a house one hundred feet long is built, by all means locate the heater in the middle of the house.

A pit should be dug 15 to 18 inches deep for the location of the heater. Make this pit large enough so that the heater can be taken care of conveniently, and the coal pit or bin should be located back of the heater and within easy reach of it. If you are located in a large city where first-class plumbing can be had at a reasonable price, it may be as well for you to buy piping near at home and save freight charges, though the freight charges on material of this class are not excessive. We think, as a rule, it is better to buy a heater and piping complete with full directions in the shape of blue prints for setting up, building the brooders and operating same. Several incubator companies furnish blue prints and full instructions

for building and operating both the single row and double row brooding houses. Where their plans are followed, they assume the responsibility of proper fittings, etc., which as a rule more than offsets the freight charges, for they know what they are about in this particular line, while the ordinary plumber may be at fault.

Any good carpenter, by studying the plans shown on page 72 and consulting the accompanying bill of material, can build this single-row brood-house without making a mistake. It is really a simple affair, but should be well and snugly built to preserve the heat and keep out the cold. Brood-houses like the two illustrated herewith are extensively used by the successful duck and broiler raisers of the east.

Bill of material for single row Reliable Brood house No. 4:

4	4x4	16 ft. sills.
2	4x4	12 sills.
9	2x4	7-10 long side.
14	2x4	3-10 short side.
17	2x4	12 ft. rafters.
17	2x4	5 ft. rafters.
5	2x4	7 ft. end studs.
15	1x4	8 ft. collar beams.
6	2x4	6 ft. partition for wire.
5	2x4	16 ft. plates.

Sixteen posts set in ground, 560 ft. 8 ft. wide matched, 618 ft. 12 ft. wide matched, 160 ft. 12 in. stock for casing, 650 ft. sheeting, 5,250 shingles, 6 windows, sash 2 ft. 6 in. wide, 32 in. high, 84 ft. stock for pens, 212 ft. 12 in. stock for brooder, 32 ft. 6 in. dressed fence for ridge boards, 7 pair 4 in. strap hinges, 6 pair spring hinges for chicken doors, 25 lbs. 20 spikes, 50 lbs. 8 common nails, 24 lbs. 4-penny nails, 10 lbs. 8 finish, 1 gross No. 7, 1¼ screws for doors on brooders, 2 lbs. wrought nails, 36 lineal ft. wire netting 2 ft. wide, 1,350 ft. paper.

JOHN W. MYERS.

WHAT ONE FARMER'S WIFE DID.

Also Her Plan of Making Sure that She Was Using the Proper Amount of Moisture in Her Incubator.

On my return from a recent trip to California during the summer of 1897, I stopped at Cumming's City, in Kansas, and while there inquired, of course, about the poultry industry in that locality, when my host told me of a woman who lived eight miles away who hatched chickens by the thousand with an incubator. Only eight miles! I had never heard of one before who was not at least a hundred miles away. I was immediately possessed of a great desire to see that woman, and I did. I made my most respectful bow to the woman who could hatch chickens "by the thousand," but she took it all quite as a matter of course, and I doubt if she realizes the halo in which her name is wreathed in my memory.

This is the story she told me: She has a 200-egg incubator which she has been running for six years, the first three

according to instructions, with varying success and sometimes failure; the last three by a plan of her own, with uniform success. She goes to nature for instruction, that is to say, she starts the incubator at the same time she sets a hen and runs it at 103 degrees from start to finish. The chickens come out on the twentieth day.

Commencing on the third day and every day thereafter, she compares the air space in the incubator eggs with that of the eggs under the hen and regulates the ventilators accordingly. She keeps her chicks in the incubator four days after hatching, on and after the second day keeping the heat at 90 degrees with both doors wide open. They are next placed in the brooders, and for three weeks are fed on baked corn bread and afterward on timothy seed and coarse corn meal, with all the fresh water they want from the day they are hatched.

This year she commenced with 225 hens, Brown Leghorns and Barred Rocks, not choice stock but fairly good. She raises for market only. She hatched 1,600 chicks, some of them with hens. The largest number from one hatch was 178 and the smallest 124. She keeps the incubator in an ordinary living room, having tried it in the cellar and finding she has better results in the former place.

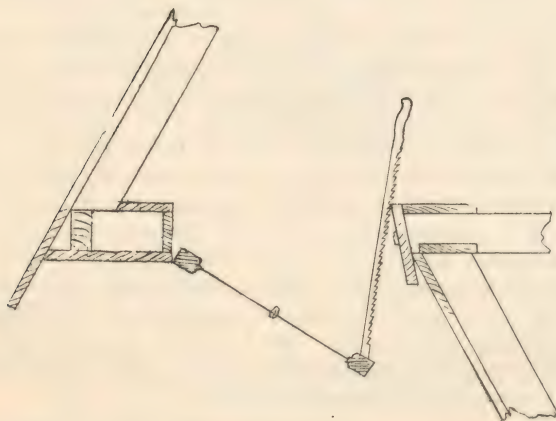
MRS. S. N. KING, Bloomington, Ill.

Double Row Reliable Brooding House

DESIGNED BY

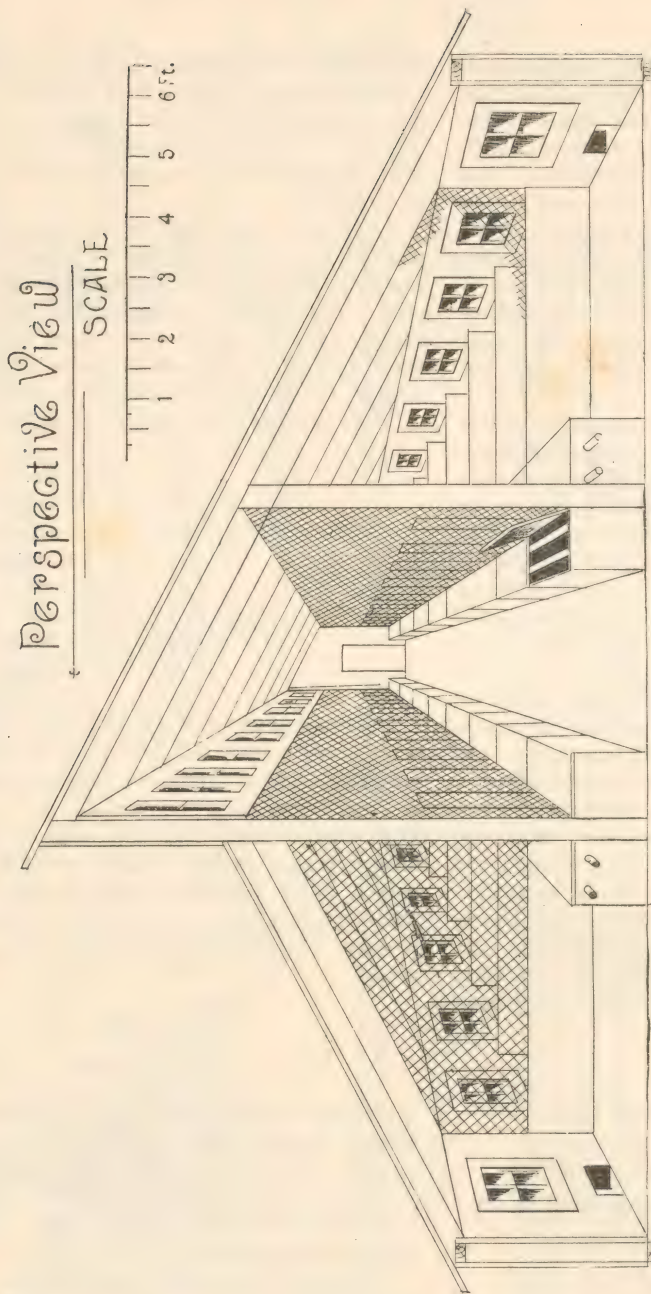
Reliable Incubator & Brooder Co.

Quincy Ill.



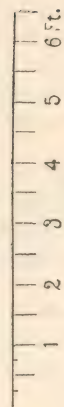
WINDOW AT GABLE
TO WIND

Bill of Lumber	
15	4 x 4 16 ft Sills
6	4 x 4 12 "
3	4 x 4 14 "
18	2 x 4 10 - Center Stud.
15	2 x 4 12 - Side "
30	2 x 4 16 - Plates & "
12	2 x 4 14 "
36	2 x 4 16 - Rafters
36	2 x 4 9 "

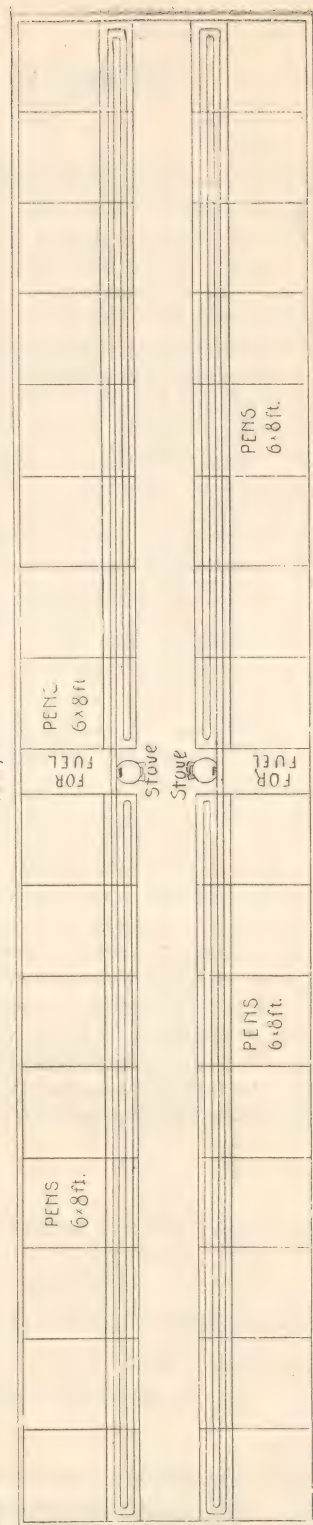


Perspective View

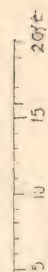
SCALE



100 ft.



FLOOR PLAN SCALE



DOUBLE ROW RELIABLE BROODING HOUSE.

THIS double row Reliable brooding-house, as illustrated and described on opposite page is, we believe, an entirely original production of the Reliable Company. It combines a number of features found in no other style of brooding-house and has several advantages that make it extra valuable. The row of gable windows fronting south permits the sunlight to fall into the north or rear row of pens during the winter time when the sun swings low in the heavens, while in the summer time when the sun is high the four-inch casings to these windows cut off every bit of sunlight from the interior. It is in the winter time that sunlight is so essential to the health and comfort of the chicks, and at this season of the year both rows of pens are taken care of in this respect.

By locating the brooders half way in the aisle and half way in the pens, with hinged lid doors opening from the aisle, the chicks can be put into the brooders and the brooders cleaned out without going into the pens. A house built after this style that is 100 feet long, is equivalent to a single row house 200 feet long, but is much more compact, is easier to keep warm and of a uniform temperature. A house of this style that is 100 feet long should have two stoves, one to heat the piping system on each side of the aisle, and these stoves when located mid-way of the building will keep the general temperature moderately warm, in fact, drums can be put on the stoves if desired, or common stove pipe can be conducted the length of the house, one going in one direction, the other in the other direction, thus utilizing practically every bit of heat that comes from the fuel. Two stoves with drums or stove pipes as suggested operated in a house of this style, that is warmly built, will keep the temperature up to 60 or 70 degrees in ordinary weather, and this will give an ideal place for brooder chicks.

The youngest chicks should always be placed in the pens next to the stoves, or nearest to the source of heat, and this will also place them in the warmest part of the building. The south and north walls of this building are to be only three feet or three and a half feet high under the eaves, are to be double, with a four inch air space between, the outer wall to be lined on the inside with building paper or tarred felt.

The house foundations measure 100x20 feet, *inside* measurement. This allows a passageway four feet in width, and leaves space for forty pens 5x8 feet, twenty on each side of the aisle. Allowing one hundred chicks to the pen until they are three weeks old, seventy-five to the pen when they are between the ages of three and six weeks, and fifty to a pen after six weeks, or an average of seventy-five to a pen, this house is calculated to accommodate 3,000 chicks.

The foundations consist of 4x6 pieces, resting on the tops of 4x4 red cedar posts that are two feet long and sunk into the ground a distance of twenty-two inches on an average—the ground being nearly level. At no point do the 4x6 pieces rest on the soil. The floor of the house is covered with three to four inches of sand and fine, screened creek gravel, and it is this dry gravel and not the surface soil that comes in contact with the sills, thus preventing them from rotting.

Pieces 2x6 are used to support the large roof, the uprights all being of 4x6 stuff. It is hardly necessary to go into such details as these, as any carpenter and builder should know what sort of lumber is required for such a building, so far, at least, as its strength is concerned. The sides of our house are

made of No. 2 tongue and grooved lumber, planed on one side. Both roofs should be shingled, the sheeting to be put on first, close together, building paper or tarred felt to be put on over this and then the shingles put on with four inches exposed to the weather, which will insure a warm roof. Of course the building can also be sealed overhead if desired, leaving a four or six-inch air space, which will make it extra warm. It pays to build a brooding house so as to have it plenty warm. It will save more than enough fuel to pay a handsome interest on the extra investment, and will save in labor and in loss of chicks as long as the house is used.

The windows (forty of them) are all of the same size, 20x40. The house faces to the south. All the windows are hung from the top and are made to open outward, so that if left open during a rain-storm the rain will not beat in.

The rear section of this house is four feet wider than the forward section, the four-foot passageway being entirely under the rear roof. The supports of the point of the roof of the rear section extend down to the ground and form part of the partition dividing the passageway and the front tier of pens.

The rear wall or back of the house is only three feet high, the extreme height of the rear section being eleven feet. This gives the big roof a good pitch. The front section is forty-two inches high at the eaves and seven feet six inches high where it joins the rear section. This roof is a little too flat for the good of the shingles.

Board and wire partitions are used, two twelve-inch boards being placed at the bottom and two-inch wire mesh above. Doors open from the hallway into each pen. The attendants and visitors are required to step over a twelve-inch board in going in and out of the pens, the other twelve-inch piece being made a part of the door. Every door is supplied with a spring so that it does not fail to close after the large percentage of visitors who, as the saying goes, "must have been raised in a barn," as they seldom close a door behind them.

In our opinion, here is the best style of brooder house for raising broilers that has been designed thus far. If a man can not raise chicks successfully in a brooder house of this kind, the chances are about ninety-nine to one that he is not qualified to raise them anywhere in any way. The bill of lumber for this house is presented herewith, and any good carpenter can build it.

Bill of material for Reliable Double Row Brooder House
No 3:

15	4x4	16 sills.
6	4x4	12 sills.
3	4x4	14 sills.
18	2x4	10 center studding.
15	2x4	12 side sills.
30	2x4	16 studs and plates.
12	2x4	14 studs.
36	2x4	16 ft. rafters.
36	2x4	9 ft. rafters.

2,100 ft. 12 in. stock for brooder and casing, 2,600 ft. wide matched, 2,400 ft. sheeting, 20,000 shingles, 48 windows 12x14, 4 lights, 48 pairs 2 in. butts, 3 gross $\frac{3}{4}$ No. 6 screws, 150 lbs. 8 common nails, 50 lbs. 20 spikes, 10 lbs. 8 finish nails, 4 pairs 4 in. strap hinges, 32 pairs spring hinges, 3,700 ft. paper, 240 lineal feet wire netting 2 ft. wide, 200 lineal ft. wire netting 6 ft. wide.

JOHN W. MYERS.

CARE OF HEATER AND PIPE SYSTEM.

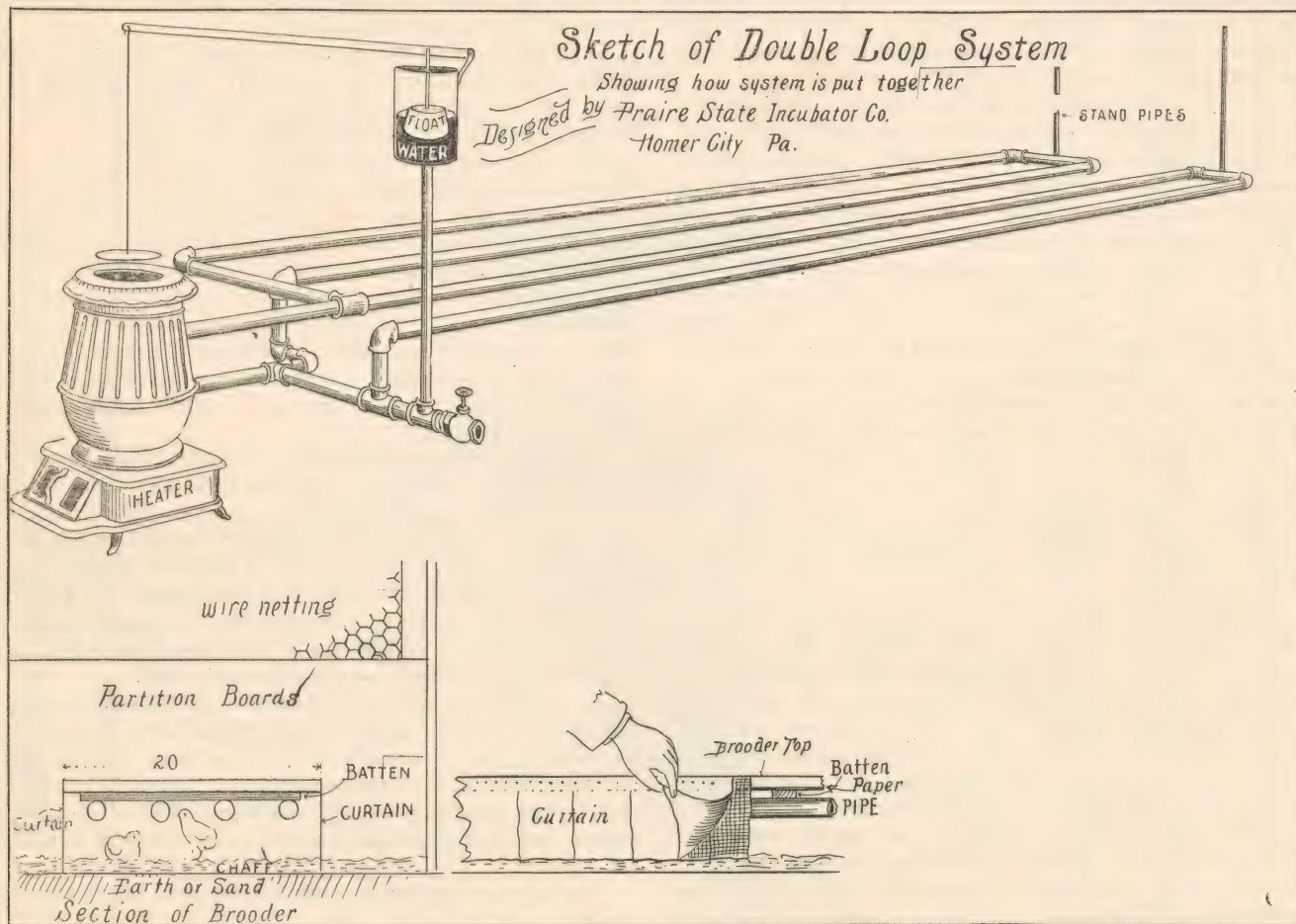
BY A. F. COOPER.

Of the Prairie State Incubator Company.

THE heater that is furnished with the double loop system is made for the use of anthracite coal. In firing the heater the object is to maintain an even temperature in the brooders and not allow the pipes to become too hot, but to continue just warm. An even, regular fire can only be obtained by the use of a liberal quantity of coal and then by controlling the heat by means of the draft. Ordinarily, coal need only be added every eight or ten hours, the grate being kept clean and the lower draft almost if not quite

end, which is the highest point, and where the air collects, there should be an air cock or an open stand pipe. If an open stand pipe is used the air escapes automatically. From this point the return pipe should go to the heater with a gradual fall of one-tenth of an inch to the foot. If this plan is followed in putting in the pipe system, you will have no trouble with the water not circulating in the pipes.

The operation of the regulator is secured by the expansion and contraction of the water in the heater and system. In the



closed. The regulator then opens the valve and allows the cold air to enter above the fire, increasing or reducing the heat as is required.

In localities in the west and south, where anthracite coal is scarce and high, economy in fuel may be secured by using soft coal during the day and hard coal at night. Soft coal will not burn over night unless green blocks of wood are charged with it, as soft coal, after the first volatile parts are burned, solidifies or cakes. Unless it is shaken down at this time the fire will go out. The object of using the blocks is to prevent the coal from caking over and it will fall down of itself after caking. While soft coal can be used, much time is saved by the use of anthracite.

When the water in the system does not circulate properly and the end pipes are cold, the cause is an obstruction in the pipes. It may be a shaving, but more usually it is air. If pipes are put in properly they should start at the heater with a rise of at least one-tenth of an inch to the foot. At the far

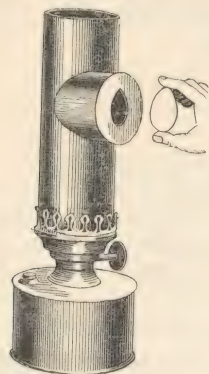
expansion tank is placed a float connected with a suitable lever to a disk covering the top of the heater, or to a suitably arranged damper in the stove pipe, and the drafts can be regulated automatically if desired. In case the lever (see illustration) opens a little too soon a little water can be drawn off at the bottom of the heater. This will cause the water to heat up more and consequently expand more and raise the lever. If the pipes are too hot and the valve is raised, the temperature can be reduced by putting a little more water in the expansion tank. This will cause the valve to raise higher and the system will cool off considerably more before the lever will close and give the fuel more air.

Brooder tops should be movable, with a curtain on both sides. These curtains can be made of oil-cloth or felt. They should be made of material that will not unravel as the chicks pick at it. It gets loose, gets wrapped around their necks and may strangle them.

A. F. COOPER.

TESTING EGGS FOR HATCHING.

As set forth elsewhere in this book, have your eggs as uniformly fresh as you can get them and reject all that are overly large or undersized; also, all ill-shaped ones, including those with ridges around them or uneven ends, and all with thin or mottled shells. You can discover the mottled shells by holding the eggs between your eye and a lighted lamp, but it is better to use the lamp egg-tester. Use it in a dark room and you will have no trouble in detecting the mottled shells. Eggs with mottled shells sometimes hatch, but not as a rule. The shells of these eggs are so much thinner than the average shell that the evaporation of moisture within the egg is too great by comparison and the chick dies by drying up.



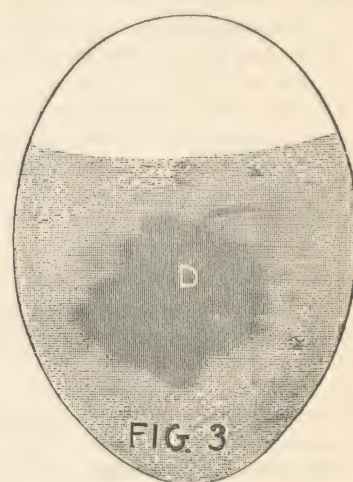
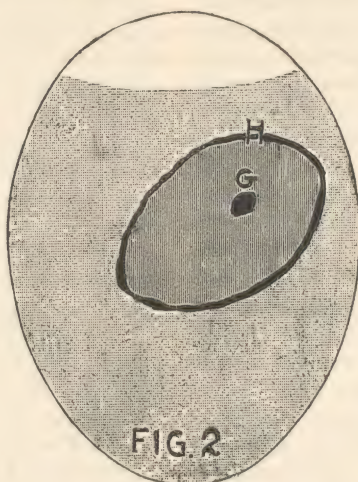
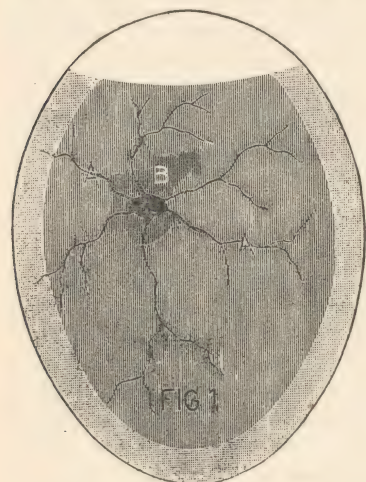
LAMP EGG-TESTER.

The two kinds of egg-testers in common use are illustrated herewith, viz: a lamp egg-tester, which is made of tin and fits on an ordinary lamp in place of the glass chimney, and a

an incubator. Fig. 1 shows a strong, well-fertilized egg as it appears on the sixth, seventh or eighth day. Fig. 2 shows a weak or imperfectly fertilized egg, one that will not hatch. Fig. 3 shows a stale egg, one that has become too old, the yolk having settled to one side of the egg. An infertile egg shows perfectly clear when looked at through an egg tester. There is no appearance of a germ, either strong or weak, or of the stale spot. It is of one uniform color, and should, of course, be rejected.

Test the eggs in the machine on the seventh or eighth day and again on the eleventh or twelfth day. There is no hard and fast rule as to the best days on which to test eggs. Expert breeders often test as early as the fifth day, for they can tell by that time whether an egg is hatchable or not, and they want room for other eggs, as they make a practice of setting two or more incubators on the same day and then shifting the eggs forward from one incubator to another, replacing the infertile eggs, thus gaining room and being able to reset the incubator or incubators that are emptied in this manner. With beginners, it is better, no doubt, to wait until the seventh or eighth day, for by this time even a novice can tell, by consulting the eggs shown on this page, whether an egg will hatch or not. If in doubt, replace the egg in the machine and wait for the second test.

A number of the eggs will appear to be all right from the fifth to the eighth days, the chicks being alive and giving promise of coming out all right, but they will die between this time and the fourteenth day, for there will be found in every



EGGS AS SEEN THROUGH A TESTER AFTER FIVE OR SIX DAYS INCUBATION.

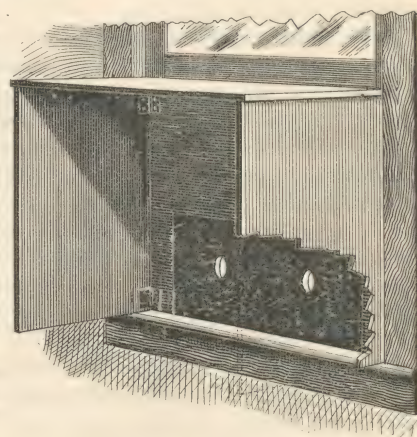
window egg-tester, one that we recommend to be used where large numbers of eggs are to be tested. Where the lamp tester is used the work should be done in a dark room, there being no other light than that furnished by the lamp. This light is confined by the metal chimney, except that which shows through the opening that is filled by the egg when placed in position. The egg should fit snugly in the opening, so that practically no light will show around the sides of the egg. By this means you can see clearly whether the egg is perfectly clear, whether it shows a stale spot, or whether it is strongly fertilized, showing the chick embryo with the veins of blood radiating in different directions.

A window egg-tester is built of common boards so as to fit into a south, east or west window, and should be painted black on the inside or covered with black cloth. Surround the openings into which the eggs fit with leather and cut an opening for the egg of such shape that the egg, when pressed against the leather, will completely fill the opening. If you have an east window, make a practice of testing your eggs in the morning, on a sunny day. If a west window, wait till afternoon, the object being to have the sun opposite you, so that you will look through the egg at the intense sunlight. Using such a tester in the way advised you can see very clearly the contents of the egg and will soon be able to tell just what the egg is worth. This tester is recommended where a large number of eggs are to be tested, for two persons can work at it, and in cold weather it is often advisable to test the eggs as rapidly as possible so as not to cool them down too much while they are out of the machine.

The three cuts of eggs shown herewith illustrate the appearance of eggs usually found in testing a lot that have been in

incubator full of eggs a number that are fertile, but which will not stand incubation, the germ not being strong enough to develop during the three weeks into a full grown and vigorous chick. After some practice many of these eggs can be detected at the second test and should be rejected.

Experience is the only safe teacher in matters of this kind, and each operator of an incubator will have to investigate matters for himself. The writer has broken dozens of eggs, "as a matter of curiosity", thus settling doubts as to particular eggs. There is no other way. It is a good idea to mark all doubtful eggs you replace in the machine, so that you will look at them closely when you come to the second test. Eggs should not be tested in an atmosphere that is colder than 65 degrees, if it can be avoided. Do not under any circumstances test eggs in a freezing atmosphere. If necessary, cover the egg-tray carefully with a warm blanket and carry the eggs to a room that is warm.



WINDOW EGG-TESTER.

GENERAL CARE OF INCUBATOR HATCHED CHICKS.

Brooding, Feeding and General Treatment—Small Quarters—Water or No Water—A Brooding Coop—An Inside Nursery Brooder.

BY J. L. CAMPBELL, WEST ELIZABETH, PA.

BEFORE proceeding with the subject proper, I wish to make a few remarks on the supposed difference between chicks which are hatched in incubators and those hatched by hens. It is only of late years that any large number of poultry raisers have been willing to admit that there is no difference between incubator and hen hatched chicks, and there are plenty of persons who still believe that a chick hatched in an incubator always has flesh of inferior flavor to those hatched by hens. I had an argument on the subject a few days ago, the person claiming that he could always tell simply by the taste after the fowl was cooked, whether it was hatched by an incubator or a hen. All such ideas are purely imaginary and arise from the fact that with a certain class of people it has come to be a common thing to class all inferior stock as incubator hatched. Whenever there is any difference between hen hatched and incubator hatched poultry the difference arises from the manner or method of raising and not with the system. Chicks hatched from eggs laid by good, strong, vigorous stock in perfect health, at a temperature between the two extremes of 101 and 105 degrees, are and always will be exactly the same in every respect, whether hatched in an incubator or hatched by a hen. Any difference between them when grown must be charged entirely to the method of raising them after they have been hatched.

It might naturally occur to many that stock which is strong and vigorous must of necessity be healthy, but not so. A strong, vigorous man or woman can be sick at times, so can any sort of animal, and poultry is no exception to the rule. Therefore it goes without saying that no person need expect to raise good poultry unless the eggs are laid by healthy hens. A bright red comb on a hen which is as lively as a cricket is always considered by most poultry raisers as a sure indication of good health, and it usually is, but it can not be relied on absolutely, because a hen may be in an advanced stage of either roup or diphtheria and show no signs of it in her comb. The very first effect of roup is to attack the generative organs or ovaries, and thus the eggs are one of the first things to be affected.

In handling the subject as stated in the heading we are going to suppose that in all cases the chicks have been properly hatched by heat between 101 to 105 degrees and not between 90 to 110 degrees. I should like you also to bear in mind the fact that a hen does not always keep the eggs at the proper temperature; they will vary from 98 to 110 degrees, but in all my experiments with hens I never had one to have good success with her chicks when I found the eggs heated above 107. The chicks often get out only to die afterwards, but when the heat gets below 100 they always fail to get the chicks out at all. The majority of good sitters, however, always maintain a temperature between 101 and 105.

For the past five years I have been experimenting specially with hen hatched and incubator hatched chicks and turkeys, both kinds raised together, both with hens and brooders. While there was really no difference between the chicks when they were hatched at the same temperature, yet the average number raised both by myself and others was the highest in the case of the incubator hatched. The incubator turkeys did the best every time. They were raised with hens in all

cases, except that some of them were kept in the brooder for the first week, and these usually did best of all. But we had no success if we kept them in brooders longer. I had four incubator hatched gobblers go to twenty-eight pounds at ten months, and they were heavier than any that were hatched under the hens.

FIRST CARE OF NEWLY HATCHED CHICKS.

All that the chicks need for the first twenty-four to thirty-six hours after coming out of the shell, is to be kept perfectly comfortable and quiet. I seldom use any other thermometer than the chicks themselves, but will state that 95 to 98 is the proper temperature. A thermometer laid among the chicks should not exceed 100, but bear in mind also that 95 on a warm day is as warm as 100 on a cold day, in other words, the chicks will be as comfortable in a brooder at 95 on a warm day as in one that is 100 on a cold day. Also remember that when we say brooder at 95 or 98 we mean with the chicks in it. If you make it 98 and then put in the chicks you will very soon have about 110. The empty brooder should seldom be warmer than 90, the heat of the chicks will very soon make the balance. No reasonably intelligent person need ever make a mistake if he will simply watch the chicks, as they are the best possible guide. If they are just warm enough they will lie around perfectly contented and sleep without getting on top of each other. If too warm each chick will try to flock by itself, and pant; if not warm enough they will crowd up in a bunch, and the colder they are the harder they will crowd. Chicks which have spent one night only in a jam are ruined beyond redemption. A part of them can always be raised with good care afterwards, but few of them will be found perfect at maturity—they may be deformed in every way imaginable. It is this one thing of crowding and jamming in a corner that has caused more trouble in raising incubator chicks than all others combined. Some would-be wise people have supposed they had solved the problem by making round brooders, or brooders with round corners, but there is nothing at all in the idea. It is quite true that chicks can jam tighter in a square than in a round corner, but they can jam where there is no corner at all quite hard enough to do the mischief. The only way is to prevent crowding at all. There are a good many things which will cause chicks to crowd, but one thing alone will prevent it, and that is warmth. Chicks that are improperly fed, or are weakly from other causes, will crowd if in a brooder that is warm enough, but even they can be stopped from crowding by using more heat. Young chicks need heat more than food. It is absolutely necessary, and they will neither grow nor thrive without it, yet there is nothing worse that can happen to young chicks than to be overheated any time during the first week after they are out of the shell. It is just as bad to overheat them after they are hatched out as while they are in the shell.

Fully half the persons who buy incubators, and I believe a greater number, have an idea that if they only can get the chicks hatched they can easily raise them, hence they will buy the best incubator they can get, and then very often, as I well know, try to raise the chicks without any brooders at all. It is quite true that chicks *can* be raised in almost any kind of an old box, provided they are kept warm and dry, with plenty

of fresh, warm air, and are well fed; but lacking any of these essentials the result will be partial or total failure, whether the brooder cost fifty cents or fifty dollars.

There is no danger that all poultry raisers will ever reach the same conclusion as to the best style of brooder to be used. I have heard some condemn the bottom heat brooder as utterly worthless, others state that it is the only kind that is fit to use at all. One of them was just as far wrong, or as near right, as the other, consequently I shall make use of my own experience and conclusions, regardless of the opinions of other persons.

Bottom heat in a brooder is not absolutely necessary, neither is top heat nor side heat, but a combination of all makes the best brooder. But all persons who try to raise chicks in a brooder must learn sooner or later to distinguish between bottom hot and bottom warm, the difference between the two is what causes all the difference of opinion between the advocates of top heat and bottom heat brooders. A hot bottom will surely destroy the chicks either by leg weakness or bowel troubles. A warm brooder bottom is one of the most essential points of complete success in raising brooder chicks, but it must be merely warm, not at all hot, just enough heat to keep it dry, and to dry the droppings.

The next best thing to this is the top heat brooder, using enough fresh litter or clean, dry soil every day to keep it thoroughly disinfected and perfectly dry, and having enough extra heat above to make up so far as possible for all lack of it below. An abundance of warm, fresh air is essential in either style. So far as the brooder is concerned success can be attained with either style, but in raising early chicks I have always had the best success by using a little bottom heat and plenty of top heat. In a top heat brooder sand should never be used, as there is nothing worse to produce cramps. Sand is almost as good a conductor as iron, and is unfit to use in any kind of brooder or coop unless it can be kept slightly warm all the time. Soil is much better, simply because it is a very poor conductor, and much more absorbent than sand.

The care of the chicks for the first thirty-six hours, we see, therefore, is all a matter of brooding. This is the first step and it is almost all important. My chicks, for the first three days at least, are always placed on a soft cloth of some kind. An old, worn out jingrain carpet suits me better than anything else, and jute sacks are very good, in fact, anything soft and rough. Young chicks must never, under any circumstances, be placed on a smooth surface of any kind. Smooth boards, tin, sheet iron, and glass (I have seen all these used for chicks to sit on) must never be used as a bottom for a brooder unless kept well covered at all times with litter, but the old woolen carpet, kept a little warm, is simply perfection for the first three days. It entirely prevents sprawling, while a smooth surface of any kind will always produce more or less crippled chicks. Warmth, quietness, and an abundance of fresh, pure air is all that is needed for the first twenty-four to thirty-six hours, as above stated. Then we are ready for the second step, and it is not hard to stumble here.

In the matter of feeding there never can be any iron-clad rules, as there are for brooding. The essential points given above absolutely must be had in a brooder if complete success is to be attained, but in the matter of feeding a great deal of latitude can apparently be allowed. I use the word apparently advisedly, because it is really only apparent. Perhaps I can make my meaning plainer by stating that it is not so much what the chicks are fed as how it is done that makes the difference between success and failure. I have tried any and all methods that I could think of, or rather all kinds of food, and I find that chicks can adapt themselves to almost any sort of food if it is fed to them in a proper manner.

Only once in all my experience did I try to raise chicks by crowding them into a very small space, and this was in the

World's Fair building at Chicago. As I used a food at that time which was rather different from any that I had ever used before or have ever used since, I will begin the chapter on feeding by telling just what and how I fed those chicks, and that those who do not know me may have no reason to think I am stating anything but facts, I will refer to a few of those who saw my chicks every day, and others who saw them a number of times. Any of these persons will tell you that I have stated nothing but facts. Before that time I was rather in doubt myself as to whether it really was possible to raise many chicks in a very small space, but I convinced myself and others that it could be done.

Of those who saw my chicks at the World's Fair I will refer to the Myers Bros. and Mr. Dean, at that time all of the Reliable Incubator and Brooder Co.; E. C. Von Culin, of the Simplicity, and the Buckeye Incubator Co. These people saw the chicks every day while growing up. Sid Conger, of Flat Rock, Ind.; P. H. Jacobs, of the *Poultry Keeper*, and thousands of others saw them while the fair lasted. I am making this digression to let those who are in doubt as to the point that chicks really can be raised in large numbers in a small space, be able to satisfy themselves that it really can be done. Not one of the above gentlemen would have the slightest reason to favor me in any manner.

I placed 200 chicks in a brooder which was three feet wide and eight feet long. The first week the chicks were kept on top of a piece of woolen carpet laid directly on top of a large tank of warm water; the second week they were placed between two tanks of warm water, the lower one kept covered with sand and fine gravel (because I could get no soil at Chicago), and outside of the brooder the chicks had a space exactly five by twelve feet, sixty square feet of floor space, and sixteen feet of this had to be used for a runway out of and into the brooder.

Those chicks were fed on what is called gluten feed, which is the refuse of the glucose factories. It is what is left of corn after the starch is all taken out, and it is steam cooked and dried. This lot of it was quite sweet, as it had been dried before it had time to sour at all. I bought some since that was quite sour and utterly unfit to feed to chicks.

Then I had all the waste bread I wanted. All the bread I saw at Chicago was what is called aerated bread, and that was the only kind I used. I really do not know but that kind of bread may have peculiar virtues for raising chicks, but that was the only time I ever had any for that purpose. I soaked this bread in sweet milk enough to make a rather thin batter when it was thin enough to stir up well. I used no salt except what was in the bread. Then I took the dry gluten feed and stirred it until it was stiff, put in some granulated bone and sometimes some oyster shell, and mixed all up together. Then I spread down clean paper each time I fed and placed the food on the paper. I took the paper all away just as soon as the chicks quit eating. They were fed this regularly three times a day, and once a day on the average onions cut up fine and mixed with it. After they were three weeks old they got some cabbage every day, and the last few weeks of the fair fresh cut green bone daily, not much of it, about one ounce a day for six chicks.

When these chicks were six weeks old there was not standing room outside of the brooder, so that I had not room enough to feed them. I then sold half of them to get room for the balance and kept these until the fair closed. They were then ten weeks old, and from first to last not a single chick of the entire lot died. I gave away part of them and sold the balance. The above tells you what I fed them with one exception, which was an ingredient that I never used before, and I have not used it since. It is possible it may have had some bearing on the result, but I would not care to say whether it had or not. This extra ingredient was flaxseed meal. I fed at first what I could pick up with one hand once at a feed, mixed in with the other

food, and I increased it gradually to two handfuls for each feed. This was used, however, only during the last four of the ten weeks. When I come to think it over I did use a few hard boiled infertile eggs during the first two weeks, but these were used sparingly and were well mixed with the other food at all times and were never fed alone. The above is what I fed, and I will now tell you how I fed it, as there is fully as much in the how as in the what.

These chicks were hatched in August and got no water until two weeks old. Soft food and water do not work well together for small chicks. They were fed each morning as soon as they could see to eat, at noon, and always before dark in plenty of time to eat all they could hold, but just as close to roosting time as possible. After I began to water them I simply gave them a drink twice a day between meals and removed it as soon as they quit drinking. They were never very thirsty, as the food was always at least damp, if not soft, but the older the chicks got the harder and stiffer I made the food.

The sand in the brooder was changed twice a week, always in the morning while the chicks were out feeding, and they were shut out until the sand was at least slightly warm. In the evening after they went in the brooder the space outside was made perfectly clean. I can guarantee you that all these things were done in just that way, because I did it all myself. Those chicks were not outside of that brooder or pen during the ten weeks, and never saw the sun during all that time. So that settled the question to my mind that chicks can be raised in large numbers in a very limited space. I will state frankly that I should not care to do it in that way, simply because it is not necessary, and it is not the best way, but there are others who may want to do it. In fact I know there are plenty of them, but I always try to persuade them to adopt a better plan, consequently I shall proceed to tell you a better way to raise chicks. I do not think I can adopt a better plan than to simply tell you just what I do myself, and if I add on certain things which I should like to do, but often have to omit simply for want of time, that will only make your success more certain if you do as I tell you.

METHOD OF FEEDING.

I stated above that there is no iron clad rule for feeding chicks. For many years in succession I have cooked all the food of every description which was fed to my growing chicks. I have also, for years at a time, fed it all raw. I have used salt daily in the food and I have fed without using any at all during the whole season. I have used nothing but ground food until the chicks were fully grown, and I have raised them entirely on whole wheat. I have fed oat meal, both dry and cooked, and in regard to it I will say that I do not feel like bragging about my success with it. I find it excellent after the chicks are as large as quail, but I never could succeed so well as I wished when I fed it from start to finish. Sometimes they did well, and at others they did not. But when using wheat and corn, coarsely ground (from half to two-thirds corn and the balance wheat), I never had any trouble whether it was fed cooked or raw. This ration can be made one-third bran after the chicks are six weeks old with good results. I always insisted on having the very best wheat and corn. Nothing but perfectly sweet grains of either will I use. The grinding also is of the utmost importance, the regular merchantable corn meal being utterly unfit to feed chicks unless cooked, either steamed or baked. It is too fine and will pack if fed raw. It pays to get the feed ground, and you can get it done at any feed mill. It should be as coarse as clover seed.

Use this meal half wheat and half corn, or two-thirds corn, and for the raw food method proceed as follows: Wet it so you can stir it quite easily, and when you are done have it so wet that the water will rise and just cover the top. Then let it stand at least thirty minutes to swell. There should be no sign of water when it is fed. Use either milk or water to wet it

with. Milk is much the better, and I like sweet milk best. When the meal is to be cooked either by steaming or baking, use more water or milk, else it will be too hard when cooked.

The above two ingredients I consider among the very best for feeding young chicks. I shall now proceed to give the various methods which I have used in feeding them, giving none which I have not used with good success in raising the chicks. I have always found that no matter what method I started with it was best to continue that plan. Any sudden change was always detrimental to the growth of the chicks. If I am feeding wet food and change suddenly to all dry, the chicks always stop growing as rapidly as they were. A change in the method of feeding should be made gradually. Note this: No matter what kind of food is used, or how it is fed, I consider grit of the very first importance. I would rather have three hundred pounds of meal and one hundred pounds of grit than five hundred pounds of meal and no grit. When it was all fed I should have the most and the best chicks with the former, though I had started even in the first place. Good stale bread is a most excellent food, and I always use some of it when I can get it, especially to start the chicks.

FIRST FEED FOR YOUNG CHICKS.

Remember that when I say corn meal and wheat meal I always refer to the specially ground meal, as I never feed the meal that is sold in the stores.

Take sweet, stale bread and wet it either with milk or water until it will stir up in a thin batter, then stir in equal parts of corn and wheat meal until you have a soft batter. To this add what would be equal to ten per cent of the whole of fine grit (there is nothing better than the Mica, chick-size, grit), and an equal amount of good beef meal. Stir this well and let stand a half hour and if it is just right it will be rather crumbly, but soft. There will be nothing in it of more importance than the grit if complete success is to be expected, but whenever it is possible to get it, add to the first feed for young chicks some finely cut grass, fresh grass I mean. It can be had as early as most people begin to raise chicks. For the first feed but very little is needed, and always place it on a clean pan, paper or board. Try to give just what the chicks will eat up clean, but should any be left, remove it as soon as they quit eating.

The number of times to feed chicks daily is not as important as how it is done and what sort of food is fed. I have always had good success when feeding three times daily, and just as good when it was five times. Those who have time to feed five times and feed a little at a time, will perhaps induce the chicks to eat a little more than when they are fed only three times. If it is properly done they will do just as well one way as the other, but it is easier to overfeed by the five meal method than by the three, and overfed chicks soon cease to grow or thrive on account of indigestion. Unless they have plenty of room in which to run and exercise it requires great care to prevent overfeeding. It is much better to feed too light than too heavy. There is nothing better to keep chicks in good health and with good digestion than onions, but they must be cut fine. They may be mixed in the other food or fed alone—the chicks are always ready to eat them in any shape you want to feed them. I always make it a point to feed some at least once a day. A limited amount of potato is also good. They are best boiled with the skin on and then mixed with the other food, or feed them whole and let the chicks peck at them. Too much potatoes will cause bowel trouble. Cabbage, turnips, beets and rutabagas are all excellent, the latter perhaps best of all, both raw and cooked. Ripe apples also are good at all times. All these things serve for variety, and any or all of them can be used with good results.

When the meal is to be fed cooked mix it up in just the same way as when fed raw, but use twice as much water, else it will be too hard. Steaming or baking are the best ways to

cook the food. Place the meal in a vessel and set this inside of another one with a reasonably tight cover, and by keeping the water boiling in the outer vessel you can improvise a steamer out of any kind of kettle or pot. Food will go much farther when cooked than when fed raw, and the chicks can eat all they can hold and never get packed crops. It digests easier and on the whole I think it pays to cook it where the cost of fuel is not too much of an object. A little fresh meat and onions mixed in and cooked along will be a great improvement at all times. The grit will have to be mixed in after the food is cooked, as it will all settle to the bottom while cooking.

Feed early in the morning, always. A chick is not thriving unless it is hungry in the morning. The crop should always be empty at that time but never through the day. A healthy chick with an empty crop is always a hungry chick. If the crop is empty once in twenty-four hours that will answer.

Feed the last in the evening just before sundown. Chickens want to go to roost at sunset, or shortly afterwards, and should have all they will eat at that time. If fed too early in the evening they get too hungry before morning and are apt to eat things which will make them sick, as they will eat anything they can swallow at such times.

Chicks are the most peculiar little animals in the world in one respect. When they have had all they want or need to eat, they are not satisfied, but start off and begin hunting around for something else to swallow just to keep busy. This is why it is important to keep something for them to peck at, it keeps them busy and prevents eating what is not good for them. This habit of chicks accounts for the fact that the first lot of chicks that is raised in any particular place will always do better than the second lot. You may fence up a yard and place a brooder full of chicks in it and raise every one without trouble. Take those away and place a second lot in the same pen, giving them the very same care and food, and you will perhaps lose half or more of them. This result may be caused by various things, lice among others, but the usual reason is that the first lot of chicks found and picked up everything which it was possible for them to eat that was good for a chick, and much that was not good, so that nothing is left for the second lot. Where room is plenty it pays to raise but one batch a year in one place. This, of course, is not possible where room is scarce and several lots are to be raised. The only remedy is to keep the yard as clean as possible. Spade or dig it up when it can be done, for each lot of chicks, or what is much better, divide the yard with a movable fence and sow grain of some kind, wheat, rye, or oats. Either one will grow and make a nice crop of grass in a short time, and the chicks will eat this and thrive on it.

NUMBER OF CHICKS IN A BROODER.

This is one of the most important questions to consider. I have proved that it is possible to raise as many as two hundred chicks in a single brooder, all in one lot. I have done it many times, and while it is possible to do so I advise the use of small brooders. Even supposing that you succeed in raising as many with the large as with the small ones, the chicks will always be the best when kept in small lots. Thirty to fifty chicks is the largest number that can be kept by most people with success. A large brooder and large yard or run will answer very well, but a large brooder and a small run require constant care to keep the chicks healthy and out of mischief. When they can find nothing else to do they will eat each other alive. They can be regular cannibals when they get started, and when they do begin that the only thing which will stop it is to take away all those engaged in it, as one or two will soon start the whole flock at it. When that happens you may about as well kill them all. The only thing to try is to divide them all up and scatter them around, but even that will sometimes be useless. I had that experience twice. The first time I lost only a few, the second time nearly half the whole lot before I

stopped the trouble. I never could see any reason except pure cussedness for the cannibalism, but I soon learned that the only way to cure it was to prevent it entirely.

They never begin unless confined in small yards, so that a good, large run is a positive preventive, but where this is not possible the only other plan is to furnish the chicks with a variety of things to do. Keep them busy so they will have no time for mischief. Give them something to peck at all the time and feed some freshly ground butcher's scraps. Nail some tough pieces of lean meat along a board so they can all reach it. That will keep them busy and furnish good exercise. This was the only thing which I could find for them to do which would stop them from eating each other. I have had none of that sort of trouble for a good many years, but I am often called on by others for a remedy for the trouble. Leghorns are the worst and Rocks are bad also, but I never saw Brahmas do this. I never knew of chicks doing this except when kept in large flocks, and at ten days to three weeks is the age, so it can safely be stated that it is always caused by crowding. It is not for lack of food, because they will eat all they can hold and then immediately start on a chick and disembowel it, and they can do it in two minutes after they have learned the operation.

The best plan to adopt when using large brooders is to keep them with the brooder until large enough to do without heat and then transfer them to brooding coops in lots of thirty or less. The sooner the chicks can be induced to perch the better it is for them, both as to health and plumage. In a properly constructed brooding coop they will learn to perch in a short time. The coops should be made large enough to hold the chicks after they are fully grown. If the perches are placed one foot high they will usually take to them in a short time, especially in warm weather, and if they do not they can be taught to do so by placing them on the perches a few times.

All the openings must have wire cloth or mosquito netting placed over the inside and a glass arranged to slide over the outside to keep out rain and cold. If the chicks are confined to these coops until each flock learns its own coop they will stick to them until taken away. The mosquito wire is necessary both to keep out cats and rats and mosquitoes. When numerous the mosquito is worse on young chicks than lice. Those that are partly naked suffer most, but they bite all kinds, especially on the head.

After the chicks have been transferred to the brooding coops begin feeding some whole wheat, just a little at first, and as soon as they learn to like it they can be fed this once a day all they will eat. But to do that it is best to soak it a few hours, as they will fill the crops so full that when it swells there is danger of bursting them. I never could get chicks to grow as rapidly on dry food as on wet food, either cooked or raw, and as it is the rapidly growing chick which makes the best stock and pays the best, I think it always pays to use ground food. It is true that it is more trouble to feed it, and it is also true that they will do well on dry food, but much depends on the way the chicks are kept whether it is possible to raise them entirely on dry food. I never knew of any person raising a large number of chicks in close confinement on dry food exclusively. I have known it to be tried often, and have tried it myself, but it would not work. The chicks would die off no matter what was done. When they run at liberty all over the place they can be raised on nothing but whole wheat, or cracked corn, or what is always still better, both at once. Chicks raised exclusively on corn always get fat too young. It does very well if they are to be used for broilers or market purposes, but for stock either for breeding or eggs it will not produce as good birds as a variety of grain. Chicks raised entirely on wheat are not nearly so good to eat as those raised on corn, but a mixture of the two grains will always produce the best results, giving

larger and more vigorous birds. When chicks have all the ground to range over that they can use, it will make but little difference what they are fed, as they will do well anyway. The idea that good chicks can not be raised any other way than by hens arises from the fact that a hen will take a few chicks and keep them on the go from morning until night, which in the case of healthy chicks is just what they need. Take that same hen and confine her in a small place and the chicks do not grow any faster nor do any better than when shut up in a brooder.

You may take two lots of chicks with just one month's difference in their ages. Give both to hens, but place the earliest ones in a small yard, and feed them all they will eat. Give the other hen a five-acre field to run in and feed them mostly when you feel like it and let them go the balance of the time. When fall comes the last chicks will be the largest every time. I have tried that experiment often. I tried it this season. The early ones were started April 10, and were half hen hatched and the others incubator hatched. Those started May 10 were all incubator chicks, placed with hens, thirty with the one and twenty-six with the other. At this writing, October, the late ones are the largest and best in every way. A good range will take the place of a great deal of work and care, and the best breeding stock can only be produced on a large range, never in confinement.

WATER OR NO WATER?

It is all a matter of how the chicks are fed whether they need water to drink or not. They certainly can not be raised without water, but as the water and the food all go the same road it would seem as if it could not make so much difference whether the mixing were done before or after the food is eaten. I have followed the plan for many years of giving early chicks no water to drink until they were two to four weeks old, and I have kept them until three months without water, but the needed amount of water must be mixed with the food. I consider it merely a question of my opinion as against the chick's what the amount of water should be. I know that they do the best in every way for me when it is early spring and cold, when I give them no water to drink. But when the weather is warm I give them water from the start. The trouble about watering is that it is not possible to prevent them getting more or less wet. It is true that you hear of all kinds of devices to prevent them getting wet, but there is but one way and one only that ever did or ever will work even reasonably well, and that is to fix it so that every chick can drink at the same time without crowding each other. No matter what kind of device is used, when the chicks crowd to get at the water they will spill it over each other after they get it in their mouths. Then of what benefit is it to have a fountain so they can only dip in the beak? I have tried them all, and there are only two ways to it—either arrange it so every chick can drink at the same time, or never let the water run out. If they have it all the time they will soon kill themselves when it is cold. If you try to water them any other way than to let all drink at once they will get wet no matter what kind of a fountain is used, and one good wetting on a cold day sets a chick back a week's growth. For that reason alone I adopted the plan of giving young chicks no water to drink when the weather is cold, but as it would not be possible to raise chicks on dry food without water I never try to do it unless the chicks are at perfect liberty. When they run out on a good range you can keep water before them constantly and they will not hurt themselves. Then they do not take time to drink too much, or drink simply for want of something else to do, but seem to drink just what is needed.

After beginning to give the chicks water it will not do to stop it. I have tried that often enough and I find that once you start you must keep it up, even though it may not be good for them. Once they get used to drinking they will not do

well if you deprive them of water. The stoneware fountains I consider the best of all fountains because they will keep water purer and better than anything else. Galvanized iron is unfit for the purpose and should never be used. The best metal fountain of any kind is tinned copper. I have used them for ten years and there is no sign of discoloration of the water yet, and it never smells bad under any circumstances. A tin fountain or iron of any kind soon spoils the water and is unhealthy for the chicks.

PLUMAGE OF FOWLS.

Many persons who buy eggs from fancy stock breeders at a high price and fail to raise any birds which fulfill their expectations, especially as to plumage, are very apt to pronounce the breeder a fraud. Sometimes they are right, but just as often it was due to the way the chicks were fed. There is no breed of fowls which will show the effects of improper feeding in the plumage quicker than Brown Leghorns. I can take a lot of chicks from the best Browns in the country, divide them in two lots and feed so that four out of five in one lot will show a great deal of white in both wings, and the other lot will show little or none. It is only the rapidly-growing, well-nourished and healthy chick which can produce fine plumage. Cracked corn and wheat is an excellent food for chicks, but feeding on that entirely in any kind of close quarters will produce not only stunted chicks but many of them will have wings half-white. The greater part of them when they reach maturity will molt out and not show white again perhaps, but chicks raised from them will be certain to show more or less white.

There is not a strain of Browns known to me that will not throw some white no matter how carefully fed. The white is in the blood as far back as you can go, and it will crop out. In fact it is the hardest thing with which breeders of that fowl have to contend. But weakly, poorly-fed chicks of any breed will not have fine plumage. A growing chick must have animal food or its equivalent to make the best and most rapid growth. The best equivalent of all is a large range where they can find plenty of bugs and worms. Such chicks will not only eat more food than if placed in confinement, but they will grow faster and larger and stronger, and will usually have fine plumage. If not it will then be the fault of the stock.

The more food you can get a growing chick to consume and keep in vigorous health, the better the chick is likely to be when grown, yet an overfed chick will make the very poorest kind of a chick you can raise even if you do succeed in raising it at all, paradoxical as it may seem. The way to get a chick to eat the largest possible amount of food is not to give it all it will eat. Just put down all the food they will eat and a little more and see how soon it will be until they will eat less and less every time until they practically quit. I prefer to see them eat every bit and then chase you all over the yard for more. Then watch them stuff the next time you feed. It is so easy to overdo the thing. It is just like walking a tight rope, the least bit to one side and over you go. There is about one poultry raiser in twenty that can feed just the proper amount all the time. The easiest way for any person to learn is to take plenty of time. First put down about half what the birds will eat, and when that is cleaned up keep giving a little more until they quit. This will soon teach an observant person just how much to put down. I know persons who put down enough wet food in the morning to last all day and who raise some chickens, but it is a very poor way.

As stated above, the best food to produce fine plumage must contain animal food. I like best of all perfectly fresh butcher's scraps and a good bone mill which will grind quite fine. If it can be had at any time it is best ground up raw and fed at once a little by itself or in the food, just as you prefer. I believe to feed alone is rather the best, but unfortunately

most breeders cannot get it fresh every time, and the plan for such to adopt is to roast or bake enough to last a week or two weeks at a time. Do not burn but just brown it, then grind it up and it will keep perfectly sweet in hot weather for a month, and, incidentally, it is much easier to turn the grinder when the meat is cooked.

Another good reason for roasting the scraps is that you can use the machine all through the hot weather without cleaning more than a couple of times, in fact it will not smell bad if not cleaned at all if the machine is kept in a perfectly dry place. But if ground fresh it will have to be cleaned every day in warm weather and once a week in cold. This is absolutely necessary or the machine will poison the chicks.

The heads of cattle and sheep, if you get them as soon as life is out of the body, are hard to beat as animal food for growing chicks, but it is rather more work to cut them up than I like, although it pays if you can spare the time. In case you live next door to a slaughter house you can get nothing better and easier to use than a little fresh blood, just enough to color the food red, but unless perfectly fresh it is the worst possible food to make chicks or fowls sick. When fresh it is both stimulating and very nourishing and produces rapid growth. It can be cooked also in a steamer and is very good that way. It can be kept sweet several days in a cool cellar even in warm weather. Steer clear of tainted animal food of any kind whatever. It is always more or less poisonous, often fatally so, and is the worst food to produce bowel trouble that can be fed.

I am aware that it is not convenient or even possible, for a great many poultry raisers to get fresh scraps or heads, while others have not the time to grind them if they had them. I am one of the latter, although I do use a great deal of it that way. Some prepared bone and meat may be used, but it should be purchased of responsible manufacturers who put up the meat before it becomes tainted. I have tried some brands which produced bowel trouble, but it was due to the tainted meat used.

All such food should be fed very sparingly at first, say one ounce for one hundred chicks one week old at a feed, and gradually increase it until at two weeks old three to four ounces are used. It must depend on the chicks, as all kinds of chicks do not eat the same amount of food. The quantity can be gradually increased until at the age of three to four months one-fourth ounce to each chick per day is used.

LICE.

It is quite common to hear it said that lice never trouble incubator chicks, but it is an error. It is true that so long as you keep them in perfectly clean quarters and away from hens or sparrows they will not get lice on them, but every chick that runs out doors is sure sooner or later to get some on somewhere or somehow, regardless of what care is used. The louse is the one enemy that is never conquered. They can be kept down, but never abolished. I have had poultrymen tell me that there was not a louse in their flock, and I have caught a hen and seen dozens on her in a minute. The trouble is they do not know how to look for them. There are several kinds that are so lightning-like in their movements that it is only those who know how to look for them that ever catch sight of them. They are of several colors, yellow, blue, gray, and so nearly the color of the skin that it is almost impossible to see them. The casual searcher, in fact, never does see them, therefore he says there are no lice, but the lice are there all the same.

The way to catch sight of these fellows is to hold the fowl firmly by the legs, lay it on one side in a good light and then turn the feathers rapidly backwards clear to the skin. Watch the skin and you will see a blue streak or gray as the case may be, but no lice. They just leave a streak and follow the feathers as rapidly as you turn them over. The yellow lice are not quite so hard to see as they stick along the feathers and are not so fast travelers as the others, but they have

a bad habit of collecting in bunches. You may look a fowl all over and almost decide there is not one on her. Then all at once you will find a regular nest. These yellow lice never suck blood, at least I never yet saw one that had red blood in it, but the other kind live on both blood and the colorless juices of the flesh and are particularly harmful. There is also a large gray louse which causes the death of countless thousands of chicks. They are so large that even when full of blood you have to look closely to be sure there is any blood in them. One or two of these will kill a chick, as they work only in the throat. The yellow lice seem to feed entirely on the scales of the skin and while they are the least harmful of all, if numerous they cause great irritation of the skin, especially around the vent. If you find a fowl all red and raw-looking at that point the lice are there, whether you can find them or not.

All these varieties of lice usually lay their eggs only on the head and throat where the fowls can not get at them to pick them off. But when they become very thick they also will lay the eggs on the feathers under the wings and all down the neck, and when they are that bad the fowl has no ambition left to pick them off.

Chicks when hatched only in the incubator and placed in a clean new brooder have no lice to start with, provided always that you are very careful to see that none were on the eggs when placed in the incubator. But watch the heads, never letting more than a week go by without an examination. I make it a point to examine some daily, using a magnifying glass to look on the heads for nits. The first time you see even one grease the head and throat of every chick, just a little. Use either lard, vaseline, or chicken oil—the hair of the dog for the bite! Use only a little, for if you grease a chick all over it is almost sure to kill it. Put a little also under the wings. If the down is greased all over the chick might as well be wet with water. Do this once a week or as often as you can find a sign of lice. When chicks are placed with hens grease them at the very start whether any lice or nits are on them or not. A chick which gets a few lice on it at first is always more or less stunted and often the feeding method is blamed when it is all due to lice.

To keep them off the fowls a good dust bath of fine dust is as reliable as any other method. Use very fine sifted coal ashes with a small amount of either fresh wood ashes or air slacked lime. Too much lime is not good for the skin. If you do not like the dust bath in the poultry house, which I do not, make them a shed outside in some place where it is dry and sunny, and if they do not use it enough scatter grain in it to make them scratch for it, putting the dust in a deep box. Snuff, powdered tobacco stems, or crude carbolic acid is excellent to mix with the dust. A pint of acid well mixed with five bushels of dust will last as long as the dust and will not hurt the fowls in the least. This is really the easiest method there is to keep down lice. Except for one reason only, and that the large amount of labor and time involved, there is no plan which I have ever tried that I like so well as to dip the fowls into tobacco water. They enjoy it immensely on a hot day, and it must not be done at any other time, unless in a very warm house heated to at least 80 degrees. I use one-fourth pound paper of Weyman's cut and dry to one gallon of water. Steep it in hot water almost to the boiling point for two hours, then squeeze dry to get all the strength you can. When just blood warm dip the fowls all under but the head. It takes from one minute to five to wet a hen, the Brahmas being the hardest of all to wet. You must work it all through the feathers until every one is soaking wet, because if a dry feather is left it will have some live lice on it. Then grease the head where it is not wet, as the tobacco will not kill the nits unless soaked a long time, and not then if fresh laid. The dipping does not spoil the plumage in the least as I was afraid it would

until I tried it. In a week's time the fowls are smooth as ever and much cleaner. Leghorns and all the small breeds are easy to wet, but the Asiatics are hard to wet, and it is no use to do it at all unless a clean job is made of it. You will not find a louse of any description for a long time afterwards. Two dippings a year are enough to keep them clean, and it will pay any one to do it who can spare the time. I fully believe the fowls are more healthy than when the dust bath is used so much. Why should not fowls be healthier if kept clean as well as human beings? I heard an old man say that his body had not been washed for thirty years, but my opinion is that he lived so long as he did because the perspiration and his clothes washed him. It is quite common to hear it said that fowls do not perspire, but that is all a mistake. I do not know of any fowl or ani-

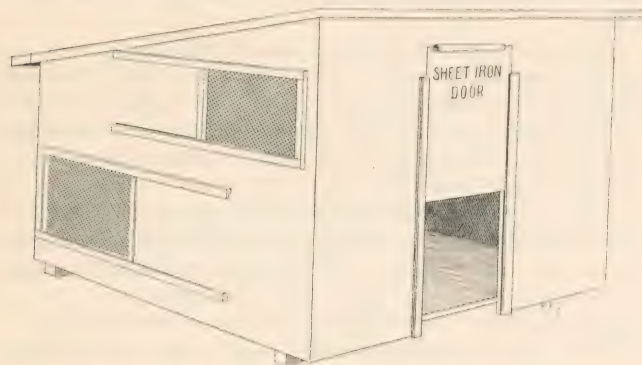


FIG. 1.—BROODING COOP USED BY MR. J. L. CAMPBELL.

mal which does not. I have had fowls and chicks sweat until they were as wet as a drowned rat, and if they can be made to sweat that much why is there not imperceptible perspiration on them as well as on any other animal? At any rate, I like to keep my fowls with a clean skin, therefore I always dip twice a year, when I can, otherwise I use the dust bath.

Young chicks can be dipped if immediately put in a very warm brooder until dry. I tried it on some young turkeys but got scared and quit, as I thought they were dead. I placed them in an incubator and they came to life again and seemed none the worse for it. As I am uncertain whether it was the smarting of the tobacco or the chilling, I do not recommend it for turkeys. They are so much more delicate and easily killed than a chick that I did not try it the second time.

GAPES.

I will close this article with a little information about gapes. This is one of the meanest troubles to which chickenhood is heir. I never see a gape worm but I wish I could cuss. These worms have been, and I expect always will be, a puzzle as to where they come from, although some people seem to think they know. Some claim they come from eating earth worms, but I kept a standing offer for a number of years of \$50 in gold for enough earth worms to give one chick the gapes and I never got them. For my part I know just two things about them which are of any benefit to me. The first is how to eradicate them, and the other is how to cure the chicks. To eradicate them skip one year entirely and do not raise a chick before September. For some years prior to 1880 every chick I tried to raise would get the gapes. In 1880 I got all my chicks raised elsewhere and did not have one on the place until September. They did not take the gapes and I never had a case of it until 1897, when four chicks had the worms. This year about thirty had them, so they are coming back you see. If they are bad next season I shall skip the following year again. That will clear them out totally, and to my mind disposes of the earth worm theory.

The best thing to cure the gapes is a wire the size of a horsehair, very smooth and bright. In lieu of a better one

pull a wire from a window screen, smooth it down straight and polish it and it will do, but it is rather soft. Stretch the chick up straight and drop the wire to the very bottom of the pipe, with thumb and finger give it a twist and withdraw the worms. It takes two persons to do this properly, one to hold the chick and the other to pull out the worms. This method can be safely used only with chicks the size of quail and larger. It is slow but sure, as they will nearly all get well. For smaller chicks place them in a tight box, get a hot brick or iron and drop carbolic acid and water enough on it to start them to coughing and sneezing. The fumes kill the worms and the chicks cough them out. This is better than the lime dust method, but as stated above, the only satisfactory method is to let some person who has no gapes raise all your chicks for one season, or else do without and buy what you need.

BROODING COOP.

Figure 1 shows the complete coop. This is not a brooder in any sense of the word as it is not intended to have any artificial heat but is to be used simply to transfer the chicks to after they are old enough to leave the brooder. They are good for use either with or without hens. These coops can be constructed very cheaply out of large dry-goods or store boxes. A good size for thirty chicks, to accommodate them until grown up, is 3x4 feet. The higher they are the better, but they should be at least two feet on the low end. A single sheet of galvanized iron 30x96, cut in two, will make the roof and have a piece left which comes in handy to make the doors. The iron should be turned down (see w Fig. 2) one inch all around to make it stiff. A cover of boards is first made from the lid of the box and the iron is fastened on it. But a very slight slope is needed to carry off the water, in fact the roof can be almost level if desired.

The bottom or floor is nailed firmly to two strips which hold it up off the ground at least two inches. Then the bottom is cut to fit inside neatly so that the sides and ends extend below the bottom a trifle all around. This is of the utmost importance as it keeps all water from running in no matter how hard it rains. It will not do at all to set the sides on top of the bottom, as the floor will in that case get wet every time it rains.

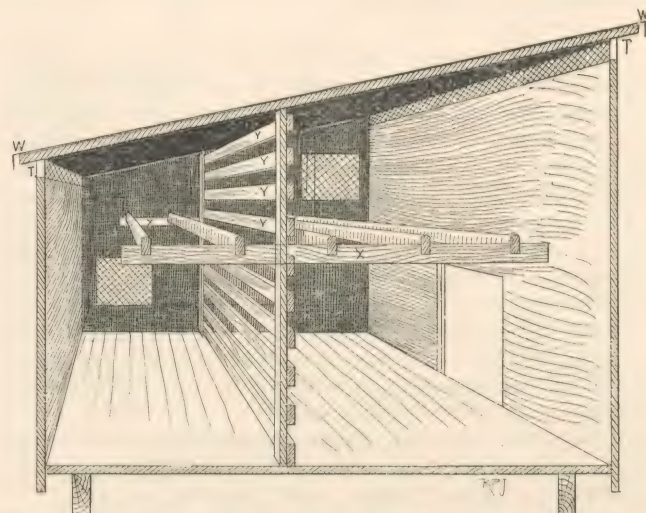


FIG. 2.—SHOWING THE ARRANGEMENT OF THE INSIDE OF MR. CAMPBELL'S BROODING COOP.

By this method of construction the coop is in three parts, roof, sides, and bottom all separate, so that it is very convenient to clean out. Just lift off the top and sides and sweep it clean as it will always be dry if plenty of dry soil is kept in it all the time. The oftener it is cleaned the better, but once a

week will do if you cannot do it oftener, always with the understanding that the bottom is well covered with dry soil.

The two bottom strips stick out far enough to catch the sides and keep them from dropping down too far. For the windows simply cut holes, in the sides only, and then nail wire cloth over the inside, and rabbet two strips for each window. Nail these on the outside of the coop for the glass to slide in. A single pane of glass 9x14 is a good size for each window. But any size convenient will do so it is not too small. Place the door in the high end always. This is simply a hole, cut eight inches square. Then use a couple of the rabbeted strips same as for the glass, and a sheet iron door to slide up and down. The ends of the coop should be one inch lower than the sides. Then when the cover is on there will be a one inch opening (see T, Fig. 2) at top of each end. This is to be covered with wire netting to keep out anything that has no business inside including rats and mosquitos, and always insures ventilation whether the windows are closed or open. The coops should always be set with doors facing east, as the wind is usually from the west. Then it will seldom be necessary to close the windows to keep the rain out.

Fig. 2 shows how to arrange the coops inside. The partition (Y) across the back end is for use only when the chicks are running with a hen. They can be fed in the back part so as to prevent the hen from scratching the food into the dirt. When the coops are used without a hen the partition can be lifted out.

A notched strip (x) is nailed to each side to hold the perches, which must drop in so they can be lifted out when necessary to clean out lice. The perches can be either round or flat to suit the ideas of the user. If flat they should be four to six inches wide, to my mind there is not much difference. When a chick grows so rapidly that the perch will spoil the breast-bone, as it frequently does when they begin perching too early, a round perch makes the impression of the perch in the thin keel of the breast-bone, while a flat board will turn it all over and make the bird flat like a duck. In either case such birds are best on straw until the bone hardens. Even then there must not be enough of them together to jam or they will be squeezed out of shape otherwise, which will be just as bad. A perch must never be placed close enough to a wall so the birds can get their tails against the wall, else there will be plenty of wry-tailed birds.

I have tried innumerable styles of brooding coops but this is the only style which ever gave me perfect satisfaction. It fills the bill in every respect. If they are made the proper size they will hold thirty chicks each without crowding. It is but a few moments work to go around in the evening and drop down all the doors and so make them safe from vermin of all kinds, including mosquitoes. If it is raining in the morning, and you do not want to let them out they can be fed in the coops. When fall and the frosts come you can feed them in the coops and keep them shut up until the sun comes up and thus guard against the first start of roup. They can be left with the coops until time to put them into winter quarters.

The coops should be left exposed to the weather all winter so as to freeze out any lice that may happen to be left over. You are in luck, sure, if some do not escape. Shut the coops up tight and fumigate, in the spring, and they are ready for a fresh lot of chicks.

AN INSIDE NURSERY BROODER.

We furnish herewith plans and specifications for making an inside nursery brooder. I have used this brooder since 1883, fifteen years. The primary use was to hold freshly hatched chicks for twenty-four hours, or until the owners came after them; also to hold our own young chicks until sold, usually about a week. But of late years I have been making use of it to start my early chicks and I consider it the best

brooder for that purpose that I have ever used. I have no trouble at all in keeping three hundred in it until they are a month old. I never had them when in any kind of a brooder or with a hen grow so rapidly as they do in this. Just think of it, three hundred chicks on a floor space of four by eight feet, that is the size of it. The whole secret of success is that I have to put but twelve chicks in a room to make it hold three hundred. All of them being so close together it is but little more trouble to feed them than if they were in three brooders of one hundred each, in one sense not nearly so much trouble, because I get rid of all the trouble of jamming and crowding. There are not enough chicks to make a jam, and the brooder being always perfectly comfortable, they are never inclined to crowd.

I placed some Brahma chicks in the brooder and some with a hen, all the chicks being hatched out the same day. I gave the hen a warm coop and fed her every time out of the same bucket that the brooder chicks were fed from. At the end of three weeks those in the brooder were just twice the weight of those with the hen. Most of those to whom I showed

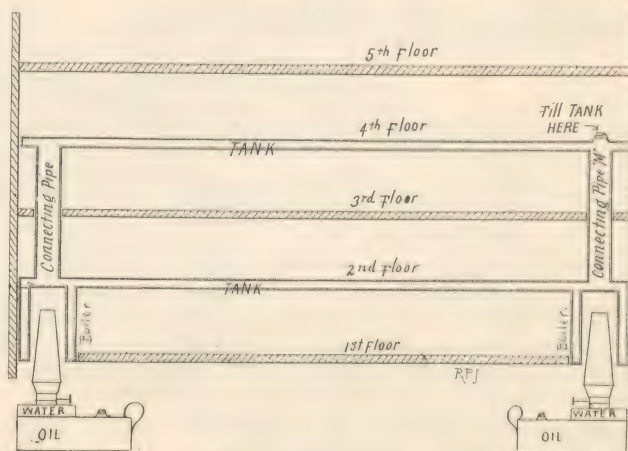


FIG. 3.—SHOWING POSITION OF LAMPS AND BOILERS AT THE ENDS OF THE BROODER.

them laughed and winked the other eye when I told them that all the chicks were exactly the same age. The sole reason was that it was cold, damp weather and the hen could not keep the chicks warm enough to make them grow. Had the weather been warm and dry there would have been no difference in the size of the chicks, but the brooder chicks held the start clear through after they were placed out of doors with the same hen.

This will be the first time the public has ever had a chance to investigate the merits of this brooder, and the only reason why they get it now is because the editor of Artificial Incubating and Brooding told me that he proposed to bring out the best book along this line that has ever been published. So I decided to allow him to illustrate it in his book.

The brooder is four feet wide, eight feet long, and five feet high. It has five separate floors, the four lower ones are divided into six pens each, making twenty-four in all. The top floor is left all in one and covered with a light frame of wire netting to keep the chicks in and rats and cats out. This top floor will hold fifty or sixty chicks easily, so that the brooder will comfortably accommodate 350 chicks until a month old. Longer than that I do not keep them in it, as they need more room than that to exercise in. The benefit to the chicks consists in giving them a good start. As only a few are together they always have good air.

Fig. 3 shows a front sectional view, showing boilers lamps and floors.

Fig. 4 shows a vertical section taken through center of boiler and lamp at one end and plainly shows the construction of the two tanks, and how the boiler and connecting pipes are attached.

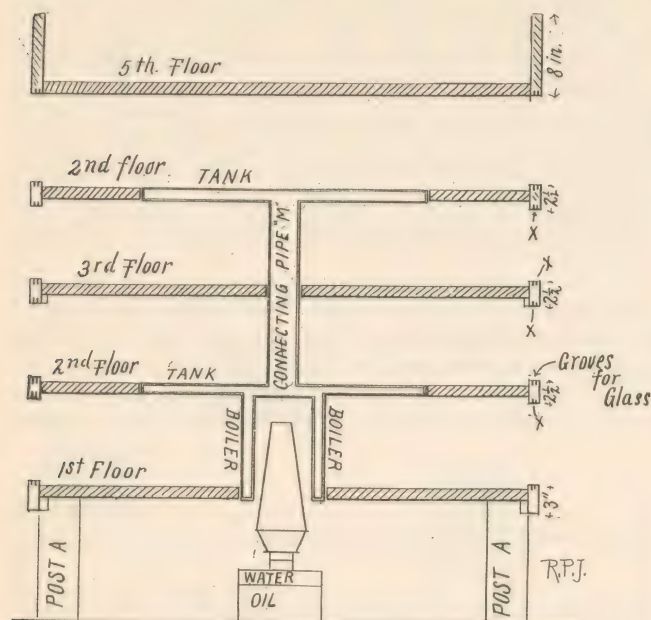


FIG. 4.—VIEW OF END SECTION OF BROODER SHOWING THE CONSTRUCTION OF BOILERS AND TANKS.

Fig. 5 is a plan view, or horizontal section, taken just at the top of lower tank, showing partitions. There are one lengthwise partition, and two cross partitions. A board ten inches wide is put at each side of tank and level with it, so that the tank and the two boards make the floor complete. There are six rooms, each 24x32 inches.

Fig. 6 shows the framework of the brooder with the tanks, floors and partitions in position. The two ends are boarded solid from the lower floor to top. The two sides have strips made fast to corner posts, with a strip screwed fast half-way between posts to stiffen them in the middle. The lower strip is three inches wide, the next three are two and one-half inches each, and the top one is a board eight inches wide. The top board has two grooves on the lower edge and the bottom strip two grooves on the top edge. The three middle ones are grooved on both edges. When the strips are fastened on they are placed wide enough apart to receive glass six and one-half inches wide. The panes are slipped in each groove alternately so that they will slide past each other. The ventilation takes place between the glasses, as the grooves are about one-fourth inch apart. When the weather is cold more glass can be placed in one groove than is in the other one, and thus shut up part of the openings so as not to give so much ventilation. By this method any one of the compartments can be opened without interfering with any other one, so that the chicks can always be kept just where they are wanted.

An opening is made in each cross partition with a sheet-iron slide over it so that chicks can be moved from one to the other when it is desired to clean it out. Cloths are used to cover the floors and tanks for the chicks to sit on, so that in cleaning out all that has to be done is to take the sacks out and shake them, as they are always dry. This should be done every day.

The four corner posts make the legs, and it should be twelve to eighteen inches from the bottom of post to first floor. A strip three inches wide is placed across each end on the inside of the corner posts, ten inches from the bottom of the floor. The ends of the lower tank rest on these, and the cen-

ter is supported by the central partitions, both lengthwise and crosswise. This is necessary, as the tanks hold about eighteen gallons of water.

Each tank is 28x60 inches, one inch deep, and requires two sheets of iron 100 inches long and 30 inches wide. After it is formed up and put together it should be well riveted with copper rivets and then soldered. The rivets must not be more than six inches apart either way, as the lower tank will have to stand a heavy pressure. The two tanks are placed eighteen inches apart with one circulating pipe three inches in diameter at each end, placed directly over the boiler in center of ends. The boilers are eight inches in diameter on the outside, and ten inches from tank to bottom of boiler. The inner part of boiler next to the lamp chimney is copper and the outer shell is iron, or if all copper it must be jacketed either with tin or iron to make it heat better. There are small pipes not shown in cut, at the corners of the tank that are simply braces to stiffen the tank and keep it in place so it can be safely handled. The lamps are made as shown, with a water chamber around the burner which makes them perfectly safe from catching fire or exploding.

To put the brooder together set up the skeleton frame. The center uprights can be placed either on the outside or inside, but most conveniently on the outside. Then nail the lower floor on the bottom of the two lower side strips. This floor should be of 7-8th flooring. Then cut a circular hole eight inches in diameter exactly in center of each end to receive the boilers. The bottom of the boilers must be level with the bottom of lower floor. This will give space of nine inches from floor to bottom of lower tank. Next place in the partitions, the long one first, the cross partitions last. Then set the tank in place. The bottom of the tank should now be just level with the bottom of the second side strip. Fit in two of the ten-inch boards at sides of tank and the second floor is complete, the tank making all of it except the two side boards.

Next nail a light strip one inch square firmly to inside of third grooved strip on each side, and then cut the boards of third floor just long enough to fit in. This floor is not to be fastened in but simply laid in. But it must be of matched boards, half inch ones will answer. They must be fitted around the two circulating pipes and this will complete the third floor.

The fourth floor is made the same way as the second by fitting in two more ten-inch boards at sides of top tank. Nail a strip ten inches long at each corner, one end to corner posts,

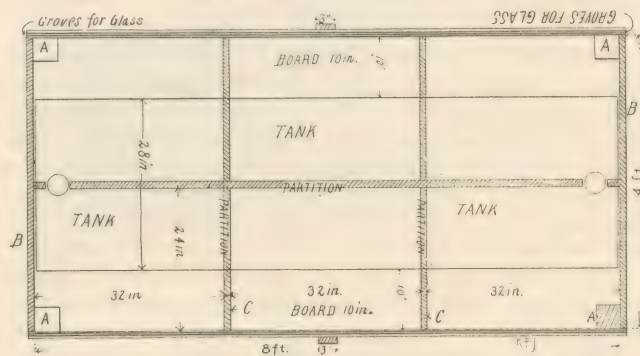


FIG. 5.—PLAN OF SECOND FLOOR.

the other to a block which can be fastened to the end boards. This will support the ends of the two boards, the center being supported by the partitions.

The fifth floor or top one is put in the same way as the third and is not fastened. The reason that none of the floors are fastened in is because in case the tank has to be taken out again the floors can be lifted out easily. Fit in the balance of the partitions and the brooder is ready to receive the glass. It is important to have the glass just right. They should not

exceed ten inches in length, else there will not be enough openings for ventilation. There should be enough glass put in so that they will lap a little at the joints. If they do not the chicks will work them apart and jump out. The glass should fit neatly enough to not slide too easily for the same reason. The chicks get to understand that they can move them, and they will do it more often than is convenient.

Each compartment must have a carpet made of anything that is convenient. Jute grain sacks will do very well, either whole or cut up to fit the floors. Place in the glass, fill the tank with water, heat the water to about 98 for young chicks and the brooder is ready for use.

This brooder ought certainly to fill the bill and meet any person's ideas. It has top heat, bottom heat, top and bottom heat both, and the top compartment has no heat at all except what little could come through the floor. The lower floor is below the lower tank and has nothing but top heat; the second and fourth floors are right on the tanks themselves and are all bottom heat; the third floor is directly between the two tanks and has top and bottom heat both. The second and fourth floor compartments are always the warmest as the chicks can sit right on the tanks. When they get too warm they move off the tanks and sit on the boards. The third floor is the next warmest, as it is between the tanks. The lower compartment is next cooler, and the top is the coolest of all.

When the chicks are fresh hatched they can all be placed in the second, third and fourth floors, and as soon as they get to crowding each other they can be distributed to the other compartments. I frequently place 150 chicks in a compartment for twenty-four hours only, or until old enough to feed. In that case the brooder holds 3,600 chicks. But not more than seventy-five can be fed in a compartment even the first time. If there are more than that all will not have room to eat.

The brooder must not be kept too warm. If it is the chicks will feather too fast and become spindle-legged, or like an overheated hot house plant. They grow faster than is good for them. The tank should not at any time exceed 100 degrees, and that only for freshly hatched chicks. Keep it just so they will not crowd in a corner, and remember that if once overheated they are much more liable to crowd. That is one of the first and worst effects of overheating. It makes the chicks tender and they will crowd even when the brooder is as warm as it should be. It is almost impossible to raise chicks which have been overheated a few times for that reason alone.

SPECIFICATIONS FOR ONE BROODER.

The tanks are the most important part of the brooder, and the most expensive part of the whole. Any good tinsmith, however, can make them without trouble, as there is nothing hard or complicated about the work. They must be well braced inside else the rivets can not be soldered, but a tinner will understand how to do that. A good strong job can not be done for less than \$18 for the tanks and lamps. A tinner might undertake to make them for less, but he would not try it the second time, so do not expect a good job for less than that, because they are fully worth that much.

BILL OF LUMBER.

Four corner posts five feet long, 3x3 or 2x3.

Two strips 1x3x8 feet two inches long.

Two strips 1x8x8 feet two inches long.

Six strips 2½x1x8 feet two inches long. These ten strips are for the glass.

Twenty-four lineal feet of flooring or matched boards cut four feet long, for the third and fifth floors and to board up the two ends.

Eight lineal feet of flooring cut four feet two inches long, for the lower or bottom floor. Four strips, one inch square, eight feet long.

Four boards 1x10x8 feet long, to fill out at sides of tank.

The partition boards can all be half inch stuff as it is more suitable than the inch, but either will answer the purpose.

1 piece 9 inches wide, 8 feet long.

4 pieces 9 inches wide, 2 feet long.

3 pieces 8½ inches wide, 8 feet long.

12 pieces 8½ inches wide, 2 feet long.

2 strips 1x3x4 feet long, for ends of tanks to rest on.

8 strips 1x2x10 inches long, to hold ends of side boards.

2 strips 1x3x5 feet long, center uprights to hold side strips firmly.

4 dozen 2-inch No. 12 wood screws.

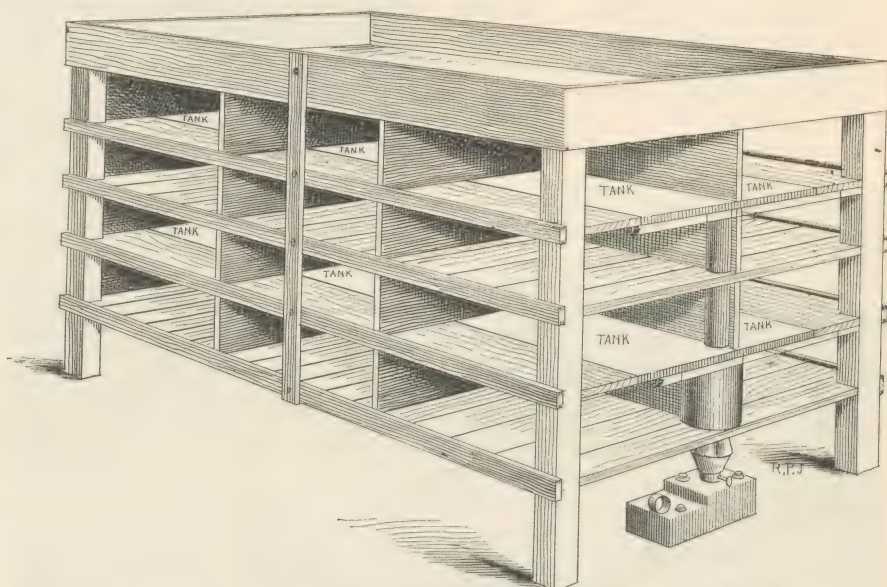


FIG. 6.—SHOWING THE FRAME-WORK OF THE BROODER WITH FLOORS AND PARTITIONS IN POSITION.

3 lbs. 6 D nails.

2 wire screens each, 4 ft. x 4 ft. 2 inches, to cover top.

This stuff can be obtained at any planing mill. The long strips for the glass can be grooved with a circular saw or small plane. The space between the grooves should be one-fourth of an inch. The glass required will be 88 lights, six and a half inches wide, and ten inches long, which allows eleven lights for each row and gives ample room to lap the glass. Use only single strength glass. The above will be everything required to build the brooder and the whole, including glass, will cost from three to five dollars, owing to where it is obtained, and the price of glass.

For feeding purposes the best things to use are small tin pans. Wash them perfectly clean each time the chicks are fed. There is no one thing that is of more importance than keeping the chicks and food perfectly clean when they are confined. It is utterly impossible to raise them any other way. If they are properly fed the droppings will always be dry and hard; if soft and slimy your chicks are either sick or being improperly fed. When chicks get in that condition the best cure is fine charcoal and a little fresh lard mixed in the food. The charcoal is an excellent preventive and a small amount placed in the food right along is good.

J. I. CAMPBELL.

RAISING THE CHICKENS.

Some Thoughts on Brooding, Cooping and Feeding Chickens.

BY A. F. HUNTER,

Editor of Farm-Poultry, South Natick, Mass.

HATCHING the chicks is but half the battle, if, indeed, it is half the battle, as many a poultryman who has rejoiced in good hatches by either hens or incubator has afterwards learned to his sorrow. With incubator chicks raised in brooders elbow room seems to be a most important factor, and want of elbow room is one cause of great mortality in brooder chicks. It is quite natural to suppose that a brooder which is three feet square (giving nine square feet of floor space), is abundant room for seventy-five or one hundred chicks and, indeed, it is for chicks as they come out of the incubator, and if we do not want our chicks to grow it is all right to crowd into a brooder twice as many as should be

market, second for breeding stock. The chickens for market are hatched usually from about Christmas time to the middle of March. Those intended for breeding stock are hatched from about the middle of March to the middle of May. To have chickens out by Christmas time we must have an incubator started early in December, and at that time it is our custom to start one incubator a week, or, possibly, four incubators in three weeks, gradually increasing to two incubators a week through January and February, and so on. For these winter chicks we have a brooder-house 130 ft. long x 10 ft. wide, partitioned into sixteen pens 8 ft. x 10 ft., each pen having a door and window in the front which faces the south.

This brooder-house is double walled, with a four-inch air space between the inner and outer walls for warmth and the only artificial heat used in this house is in the brooders themselves, excepting that in some severely cold weather we put a small oil stove in each pen to take the chill out of the air, in order that the chicks may be out in the pen. We use "Peep-o'-Day" brooders exclusively after having tried and rejected many other kinds. These brooders are three feet square, heated by an oil lamp with a one and one-half-inch wick, the air which passes into the brooder being heated by passing over a sheet iron ceiling to the lamp chamber, and by this method of applying the heat indirectly a slight current of warmed fresh air is passing into the brooder all the time. Herein, we think, is one of the great faults with many brooders as, for example, the hot-water pipe brooders in use in many brooder-houses. Those hot-

water pipes simply heat the air already within the hovers which air is practically confined to the hovers by the felt curtain in front, which is supposed to enclose the warmth within the hovers. It does that very well, but it likewise encloses the air, which the chicks have to breathe over and over again, and in that defect I think we find a clue to not a little of the mortality and consequent shrinking of profits on brooder-house chicks. The current of warmed fresh air supplied to the hovers, as in the "Peep-o'-Day" brooders, would overcome this serious difficulty, and would, in my judgment, materially reduce the great mortality of brooder chicks.

The "Peep O' Day" brooders are set in the ground to a depth of six or seven inches, which serves a twofold purpose. The lamp chamber is enclosed so as to cut off currents of air, and the chicks run out and in upon a level. They do not have to climb an inclined plane for access to the brooder. When chicks are very small, if they get chilled when outside the brooder, that long inclined plane seems impassable to them and they are unable to return to the hovers to get warmed up.



PART OF LONG BROODER HOUSE,

The foreground showing brooders out of doors, each brooder enclosed in a pen 20 feet square, made of 18-inch netting.

in it. A point that we should keep in mind, however, is that these chicks will be fully twice as large at three weeks old and probably four times as large at five weeks old, or by the time we move them from the brooder, and that factor we should have in mind in gauging the capacity of a brooder. I have come to believe that for good results fifty chickens are as many as should be put in *any* brooder; that to increase the number beyond that point is to induce crowding, which kills some and stunts others, and is extremely unfortunate if quick and profitable growth is our aim. If, as not infrequently happens, we find we have one hundred and fifty chickens in the incubator when we only expected about one hundred, and have but two brooders heated up to receive them, no harm will result in putting seventy-five chicks in each of the two brooders for a couple of days, but another brooder must be made ready at once and the one hundred and fifty chicks put into the three, which gives reasonably abundant room for all of them, and they have a good chance to grow.

We raise chickens on our farm for two purposes, first for

For our winter chickens the brooders are set in the middle of the pens in the brooder house, or, say, about four feet back from the window, and two pieces of board are fitted into slots at each front corner, extending to the side of the pen, so that the chicks are kept in that warm, sunny half of the pen until they are a week to ten days old. The first day after being removed from the incubator they are usually kept confined to the brooder, the food being put on small tin platters placed in the corners of the brooders for them. After they are old enough to be let out they are fed and watered outside, just in front of the brooders. These winter chickens will need the warmth of the brooders until they are seven or eight weeks old, but the temperature of the hover is gradually reduced from 95 degrees at the beginning to 90 or thereabouts at the end of the second week, then to 85, then 80, then 75, and the last week or so that the chicks occupy the brooder the flame of the lamp is kept as low as it can be run, to give just the least amount of warmth, 65 to 70 degrees being sufficient.



BROODERS AS USED OUT OF DOORS.
The one in foreground has a very small pen for baby chicks.

The chickens that we raise for breeding stock are brooded out of doors, it being our custom to begin setting brooders out about April 1st, the brooders being set in the ground, just as formerly inside the brooder house, but, as we have much rainy weather in April and May we have "shelter boards" to serve as protection from the rain, set a little way in front of the brooders, and under which the chicks can take refuge from storms. The chicks put out of doors are put within the brooder for about one day, then a little pen a yard square made of three pieces of board three feet long set up to the front of the brooder gives them a snug little enclosure for the few days of babyhood. Next we make a pen about twenty feet square of one inch mesh wire netting tied to temporary stakes, and the chicks have the range of this pen until they are big enough to be weaned from the brooder, which, in May and June, is at about six weeks old. Then they are moved back to a grassy ridge bordering the pasture on one side and mowing field on the other. There they are colonized in "A" coops (as we call them) for five or six weeks, when it is time to separate the pullets from the cockerels, and put the pullets out in the grass fields, in roosting coops, in families of about twenty-five each, colonized about fifty yards apart. The cockerels intended to be raised for breeding are confined in pens about 50x100 feet while the cockerels intended for market

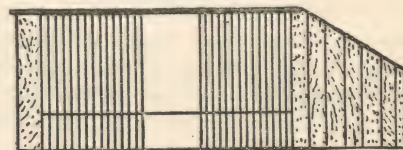
are taken back to the pens in the brooder house, which have small yards 10x20 outside, and there they are fed and grown for market.

The coops for these chickens play a not unimportant part in chicken raising, and a brief description of them may be interesting. The A coops are three feet six inches by two feet three inches on the ground and two feet high at the apex of the roof. They are built throughout of half-inch tongued and grooved pine and well painted. The front is all slats, as shown in the illustration, with a slatted gate sliding in grooves to close the front. We originally built these A coops to slope down to the ground, but found it an improvement to have a square base, four inches high, with the corners turned at an angle, to prevent the chicks from crowding back under the eaves and smothering one or two at a time. We find it a most decided advantage to have these well built coops always at hand, and as we have coops now in use which were built ten years ago and are as good to-day as when made, the economy of well made coops will be apparent. When we say that the tongues and grooves of the roof pieces are painted *before* they are put together, the reader will realize that they are thoroughly well built.



The A Coop.

The roosting coop, which is chiefly intended for raising the pullets in, is six feet long, three feet wide, two feet high at back and three feet high in front. The roof, end and back side are all of half-inch tongued and grooved pine, the front being all laths, set a lath width apart, except that a strip of board is nailed to each corner for stiffening. Two roosts of two by three scantling, slightly rounded at top, run the whole length and are a foot apart, being securely nailed to a frame of furring (one by three stuff) nine inches from the ground. To this frame we nail the ends, back side and front corner boards and then fit in at the top a frame of inch-square stuff to nail the roof boards to and to stiffen it. A coop like this will comfortably house twenty-five to thirty chickens until they are nearly grown, in fact we sometimes have pullets begin to lay before they are brought in from those roosting coops. It is quite light and can be easily moved by one man, on a wheelbarrow, easily moved its length or width to fresh ground, or it can be tipped up and droppings removed, and it is a perfect summer shelter. If they are to be used in the spring or fall, when the nights are cold, an improvement would be to make a front of half-inch boards, hinged at the top edge, so it could be swung outward and upward and rest upon folding legs hinged at the bottom corners, which would become a roof to shelter the birds from rains. One disadvantage of this light coop is, that it may be easily tipped over by a high wind, especially when the chickens are all out of it, as during the

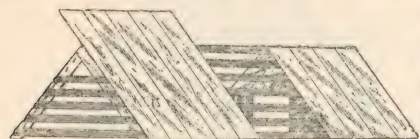


Roosting Coops for Large Chicks.

are taken back to the pens in the brooder house, which have small yards 10x20 outside, and there they are fed and grown for market.

day. To prevent it from so tipping over a flat stone should be placed on each front corner of the roof.

The gate space in front of the coop gives access to the whole inside when the pullets are to be removed. The gate is made of laths nailed to two strips one inch square, the left hand ends of which are long enough to slip in behind the



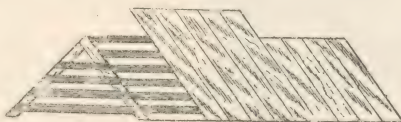
As a Shelter from Sun.

lath front, the right hand side being secured by one or two buttons. If one prefers, these gates can be hinged at one side or the other and secured by a hook or a

button, but we have found it a convenience to have them wholly detachable, and so make them.

Shelter from rain and sun is of quite as much help as a good coop to sleep in. By experimenting in different ways we learned that it would pay well to have "shelter boards" always ready, just as are the coops, hence we make them of the half-inch, tongued and grooved pine taking five strips three feet long by six inches wide for each shelter board. These strips are securely nailed to pieces of inch-square spruce at top and bottom, and then the weather side is well painted. We make a

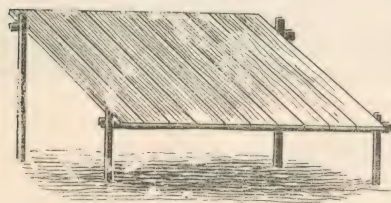
light frame of the inch-square spruce strips and laths to fit up to the A coops when we want to put the shelter close to the coop, using one of the 2½ x 3 foot shelter boards as shown in



As a Shelter from Rain.

the illustrations. As the chicks get a little older we move the frame out a little, set athwart the front of coop, and put two shelter boards over it side by side, setting it so that it furnishes shade if the sun is shining, or protects from a driving rain, of course adapting it to the direction of the wind.

When we move the pullets out into the field and into the roosting coops we set upon stakes and a strip of furring, a shelving roof seven and a half foot long by three feet wide, slightly sloping to the south about eighteen inches high in



A SHELTER FROM SUN AND RAIN
IN THE FIELD.

front and a foot high at the back. By these devices we more than double the available shelter from rain and sun and correspondingly increase the comfort of the growing chicks. Obviously, if they have to be crowded into their narrow sleeping quar-

ters on a long rainy day or to get away from the hot sun, they are not making good growth, and by so simple an expedient as we have here outlined we more than double the protection and by so much promote their comfort.

FOODS AND FEEDING.

As we stated at the beginning of this article, we raise two kinds of chicks, chickens for market and chickens for breeding stock. The food for the first month or six weeks is practically the same for each class, but at the end of six weeks we begin to feed the market chicks a richer and more fattening food, they of course being kept separate from the chicks intended for breeding stock.

Feed often and feed but a little at a time is the rule for young chicks. We feed five times a day until they are about six weeks old. It is important that no food be left standing

for the chicks to trample dirt into or to get sour in the sun. If they have not eaten it all in twenty minutes to half an hour, remove it. Nothing causes more bowel looseness and dysentery than sour food. Our chief foods for the first six weeks are coarsest oatmeal, slightly moistened with sweet milk if we have it, if not, with water, and waste bread ground to rather coarse crumbs in a bone mill. This also is moistened with sweet milk or water,—slightly moistened, so that it is still crumbly, and not "pasty." The oatmeal is just such as is cooked for a breakfast dish on our table; in other words, it is oat meats ground very coarse. This we buy of wholesale grocers, by the barrel, at a cost of about two cents a pound. The waste bread is the broken pieces, part-loaves, rolls, corn cakes, etc., from hotels and restaurants and costs about a cent and a half a pound. This bread we buy by the hundred weight and spread on the barn loft floor to dry. When thoroughly dry it is ground into coarse crumbs in a bone mill. The first food early in the morning is the bread crumbs, slightly moistened with sweet milk or water; the second, about nine o'clock in the morning, is oatmeal slightly moistened, a little before noon bread crumbs again; about half-past two oatmeal again and about five o'clock a little cracked wheat or finely cracked corn. Twice a week a little lean meat is boiled, chopped fine and mixed with one of the bread or oatmeal feeds, or the infertile eggs (clear eggs) from the incubators are boiled hard, chopped fine shells and all, and mixed with the bread crumbs or oatmeal.

It is very important that the chicks have grit to grind their food, and as baby chicks are hardly to be trusted to supply themselves with good grit we sprinkle a pinch of fine grit (or coarse sand) upon the small tin plates once a day just before feeding, or, if preferred, it can be mixed into the food. Grit in the gizzard to grind the food is a most important factor in preventing indigestion and looseness of the bowels.

Green food is another important aid to good health. If the chicks are cooped upon fresh grass the problem is easily solved because they will help themselves. Obviously, the January, February and March hatched chicks can not have access to fresh grass neither can the larger chickens shut up to be fattened for market, hence a supply of green food must be provided. Cabbages, onions, lettuce and onion tops all make a good green food, which, for the baby chicks should be chopped fine in a vegetable chopper. As soon as the grass begins to grow the lawn mower trimmings are an excellent green food supply, and the same can be said of weeds from the garden, which are easily obtained. It is a comparatively easy matter to supply the green food if one has the will.

We are well aware that many readers of this book can not get waste bread from hotels and restaurants, and to such we recommend the making of a johnny cake of mixed meals baked very thoroughly, and we will give also the rule for "Excelsior Meal bread" as recommended by Mr. I. K. Felch. "Grind into a fine meal in the following proportions: 20 lbs. corn, 15 lbs. oats, 10 lbs. barley, 10 lbs. wheat bran. Make the cakes by taking one quart of sour milk (or buttermilk), adding a little salt and molasses, one quart of water in which a large heaping teaspoonful of saleratus has been dissolved. Then thicken all to a little stiffer batter than your wife makes for corn cakes. Bake in shallow pans until thoroughly cooked. We believe a well-appointed kitchen and brick oven pays, for in the baking of this food enough for a week can be cooked at a time." It is very certain that a cooked food of this kind is a decided help to good growth in chicks, and as we on our farm want a good growth, we study to promote it by feeding a good food.

Not a few farmers and poultrymen think that oat meal as a food for chicks is a luxury. Wright's "Practical Poultry Keeper" says: "With regard to feeding, if the question be asked what is *the best* food for chickens, irrespective of price, the answer must decidedly be, 'oatmeal.' After the first meal

of bread crumbs and egg no food is equal to it, if *coarsely* ground, and only moistened so much as to remain crumbly. The price of oatmeal is, however, so high as to forbid its use in general except for valuable birds; but we should still advise it for the first week in order to lay a good foundation."

We are obliged to differ from Mr. Wright as to oatmeal being an expensive food for chicks. It may look expensive to pay \$4.00 a barrel (two cents a pound) for oatmeal for chicken food; but it goes so far, that we have found it a decidedly economical food. We use perhaps fifty dollars' worth of oatmeal a year and it makes about one-fifth of our chicks' food ration for the first three months of their life. Considered simply as a food ration it is economical, but when we consider that it is a good foundation for the future usefulness of the birds and that a good foundation for chicks means eggs in the basket next fall and winter,—then we realize that oatmeal is a cheap food in the best sense of the term.

By the time the chicks are six to eight weeks old the principal dangers of chickenhood are past and the two different methods of feeding are inaugurated. The chickens intended to be raised for breeding stock are put out in the fields, where they have a grass run and free range. The chickens intended for market are kept confined in the brooder-house pens and yards and fed a slightly different grade of food. The principal difference is in increasing the amount of cracked corn and corn-meal of the market chicks and cutting off the oatmeal, of course the green food being plentifully supplied and grit being constantly accessible. The chicks in the field intended for laying and breeding stock must have a liberal supply of nourishing, strengthening food, which will build up a strong, healthy and vigorous body, with stores of strength to lean upon when maturity shall come. The breakfast is bread crumbs, continued usually until the chicks are about ten weeks old, when they are graduated into a morning mash of cooked vegetables (which makes about one-third of the whole) and mixed meals, being equal parts by weight of corn-meal, ground oats, fancy middlings and bran (or shorts). This is salted about as it would be if it were food for the table. The vegetables are potatoes, beets, turnips, carrots, onions,—anything in the vegetable line, thoroughly cooked and mashed fine, the mixed meals being stirred in until it is as stiff as a strong arm can make it. The breakfast in the morning is this mash; in the middle of the forenoon a light feed of coarse oatmeal, moistened; just after dinner a light feed of cracked wheat and about five o'clock whole wheat or cracked corn, one day the other the next. About twice a week we have fresh meat, (butchers' trimmings), which are boiled and then chopped fine. This we mix with the oatmeal (about half and half) for the second feeding. We have also a bone cutter and twice a week the chicks have a good time wrestling and trampling over each other in their eagerness to get the fresh cut bone. Cut bone, if perfectly fresh and sweet, is one of the best animal food supplies that we have, but, if this is not available, meat meal or beef scraps should be mixed into the morning mash, about one-quarter ounce per bird per day, for young birds, increasing to about one-half ounce per day as they approach maturity.

We vary the food ration continually within the range here described. For instance, one day the food will be mash, bread

crumbs, cracked wheat and cracked corn; next day mash, oatmeal and chopped meat, cracked corn and whole wheat; the next day bread crumbs, cut bone, oatmeal, cracked corn, and so on. The intention is to feed only what the chicks will eat up clean and quickly; but we break the rule so far as the last feed is concerned and the boy goes around a second time twenty to thirty minutes after feeding, and if the food is all eaten up clean three or four handfuls more are put down so that all shall have a chance to "fill up" for the night. If a handful is left uneaten it quickly disappears in the morning, and as it is always dry grain it does not sour and there is no danger from leaving it out.

We have said nothing about fresh water because it goes without saying that fresh, clean water must always be accessible to the chickens. We water them three times a day, morning, noon and late afternoon; sometimes going around between whiles if it is hot weather and the chickens likely to drink a good deal. The water dishes are carefully rinsed once a day and water which is fresh and cool is always accessible to them. Grit to grind the food is another necessity, a pan of which is placed near each food trough out in the field, or a small box of it in each pen in the brooder house. We have personally noted that chickens when let out of the coops in the morning would go to the grit dish for two or three bits of grit before going to join their mates at the food trough.

Thus far we have been writing about chicks raised for breeding stock. When the market chicks are six to eight weeks old we cut off the oatmeal (or ground oats) from the food ration, double the quantity of corn-meal and cracked corn, feeding also no wheat or barley, feeding them occasionally, say once a week, a feed of whole oats for a change. The corn-meal and meat meal are gradually increased and a week to ten days before the chickens are to be marketed a very little gluten meal is added to the ration and the meat meal practically doubled in quantity until we are feeding a full ounce per bird per day. With this decidedly fattening ration the birds should go to market in first-class condition and bring top prices for market chicks.

The chicks intended for breeding stock have free range and can roam over the fields at will in search of insects, worms, etc., the exercise of ranging promoting growth and good health. We study to promote the comfort and well being of the chicks, believing that it pays to do so. The coops are kept scrupulously clean by being moved to fresh ground every other day, and every reasonable pains is taken to insure steady, continuous growth. It is the full egg basket in November, December and January, when eggs bring top prices and pay the creamy profits, that is being planned for and worked for in this good care and good feeding, and we have abundantly proved on our farm that this good care and good feeding pays richly. We cannot get a valuable thing for nothing; the good things of this world come by working for them, and the good profits that are to be gained in poultry raising have got to be worked for. With us the problem is early hatched pullets kept growing so that they shall come to laying maturity in October, and then kept laying. Our pullets are kept growing, and after they reach laying maturity are kept laying, by good care and good food.

A. F. HUNTER.



HOW TO USE OUTDOOR BROODERS.

Single Brooders Advocated—Crowding—Caring for the Chicks—Runs—Temperature—Cleanliness Essential to Success.

BY E. F. HODGSON, DOVER, MASS.

Inventor of the Peep-o'-Day Incubators and Brooders.

PROBABLY no one subject in poultry raising perplexes the amateur more than the problem of the artificial raising of chickens. There are many different systems in use on the large poultry farms of this country, and the more one looks about him to determine which system is the best suited for his particular needs, the more he is puzzled. Many persons start into this business with large ideas of what they are going to do, and they naturally want what seems to them the best and easiest way to raise their chickens on a large scale. Long brooder houses heated by hot water pipes attract their attention perhaps more than any other system. Although these brooding houses have been successful in the hands of many poultrymen they have proved fatal in the hands of many beginners. Experience has taught us that if chickens are kept in small colonies they will do better than will those cared for in large numbers in one building. For this reason the small individual outdoor brooders are being extensively used and each year are growing more in favor among the practical poultrymen. We find that as soon as the first signs of spring appear the chickens must be allowed to run on fresh ground to obtain the best results.

An outdoor brooder, with fifty chicks, moved to fresh ground once or twice a week or their yards changed to different parts about the brooder, is doing all that is possible to insure health in this direction. Of course the brooder should not be put out of doors until after the snow has gone. In our northern states the first of April is soon enough. A system now in use on many of our most successful farms, consists of using long or small buildings to run the outdoor brooders in during the winter, the brooders being put out of doors after the early chicks are brooded. In this way the house is left clear so that the early chicks may be raised to maturity in it, while the brooders are ready to care for the second and third lots out of doors. In the south no houses are needed at any time, and the chickens are better off without any other protection than the brooder.

Where small houses are used one brooder is placed in each house. After the brooder is removed the house is used to raise the chickens in and later on for a poultry house for the laying stock, the same applying to the long houses with one brooder in each pen. These pens are about eight to ten feet long by about five feet wide, the brooder being placed next to the alley-way, or walk at the rear, so that the lamp can be cared for and brooder cleaned without entering the pen. If there is no walk it is best to place the brooder near the center of the pen as it will be more easy to attend to it.

With this arrangement the buildings are kept in constant use the year round, while a building used only for brooding purposes lies idle a greater part of the time.

When it is the object to raise laying stock no buildings are required to run the brooders in as April is soon enough to start the chicks, and they are better off out of doors. A very convenient way to arrange a run-way or yard is to have it fastened to the front of the brooder and extend about twelve feet out. Most outdoor brooders are about three feet wide, so that a run this width by twelve feet long and two feet high is a good size and the top can be covered if necessary to keep off chick enemies. Another arrangement is to make sections of

fencing about twelve feet long by two feet high. Four of these sections tied together at the corners will make a yard twelve feet square, which is generally large enough until the chicks are ready to leave the brooder. For the first three or four days a small yard should be made of three boards three feet long by eight inches wide and fastened to the front of the brooder, so that the youngsters cannot stray away from home. As soon as they become acquainted with their new quarters it can be removed, giving them the larger yard.

With the above system the problem of how to obtain green food for the young chicks is solved, but if it is not possible to allow them grassy run-ways, give them tender grass cut in short lengths or most any kind of cooked vegetables.

As we are naturally anxious to have our flock grow rapidly and mature into strong, healthy birds, we must look after their comfort continually. This close watching and care means more

to our and their success than any other part of the poultry business. Unclean and overcrowded quarters are the two most common evils that confront the poultryman. If we could see the misery and filth in which the larger portion of chickens are raised, we would not be surprised that there are many failures. Even the most careful person is apt to let these apparently slight things go and is only aware how much better off he and his poultry are after he has faithfully cared for them.

If the brooders and coops were cleaned every day and fresh loam or sand sprinkled on the floor, it would do more good than many extra dollars spent for grain, for no amount of food can counteract the ill effects of unclean or crowded quarters.

Fifty chickens are all that should be put in any brooder, no matter how large, and about thirty in a coop after leaving the brooder. Both brooder and coop should be well ventilated, and so arranged as to be easily and quickly cleaned. The



MR. E. F. HODGSON.

chicks should be removed from the brooders when four to eight weeks old, according to the weather, and colonized in small, well-ventilated brood coops, large enough to care for about thirty chickens until they are three or four months old. Then they should be removed to larger coops where they can roost. By using these small brood coops it enables one to remove his chickens from the brooder while quite young, leaving the brooder for the next hatch. There are many chickens lost each year on account of poorly constructed coops after leaving the brooder, and if more care were taken to prevent this the result would be more and better laying stock in the fall.

The correct temperature at which to run a brooder varies according to the different makes and it is best to follow the directions sent with the brooder you buy. Commencing at 95 degrees and gradually lowering to 80 degrees within three weeks is as nearly correct as can be given for general use, but it depends upon the position of the thermometer. Overheating or chilling is not good for the very young chickens, but a good brooder should be so constructed as to overcome these

difficulties to a great extent. Plenty of clean water should be kept in a shady place during the warm days, and it is well to water them twice on hot days. Where there are no trees to furnish shade it is well to make roofs about six feet long by three feet wide of rough boards set on legs about two feet from the ground. This will be large enough to protect thirty good sized chickens.

If your coops have movable floors (as they should have) tilt them back during the sunny days for it will dry and purify them as nothing else can. Feed the chickens in clean troughs large enough so the chicks will not crowd while eating. Throwing the food on the ground is a common method, but a poor one. Perhaps a board about three feet long by eight inches wide with lath tacked around the edges to form a dish, is as good a trough to use for feeding young chicks as any, but care must be taken to clean the troughs every day and to have no food around to become sour. In other words provide clean, sweet food and water, and clean, well ventilated quarters at night, and you will be doing all that is possible to raise strong, healthy chickens.

E. F. HODGSON.

CHICAGO AS A CAPON MARKET.

When Capons are in Season—Prices Obtainable—Weights in Demand—Crosses for Capons.

BY P. S. SPRAGUE, PRESIDENT SPRAGUE COMMISSION COMPANY, CHICAGO, ILL.

In dressing capons the feathers are left on the neck, legs, wings and rump, and the tail feathers also are left. Otherwise capons should be dressed for this market the same as other fowls, *except that they should be dry-picked*, as it would be impossible to scald them and leave part of the feathers on, and if they are scalded the same as other chickens, they will not bring any more than the price of common fowls, for they are distinguished more by the way they are picked than in any other manner. All other chickens sell better in this market scalded, while turkeys sell best dry-picked.

Capons are in the best demand with us from the first of November until the first of May. The highest prices are generally obtained from January to May. For the last year or two there have been a great many common roosters dressed in capon style and sent to this market, which has hurt the capon trade some, but still good capons always bring a good price. The larger the birds are, the more they will bring per pound. Birds that weigh less than seven pounds each will not bring any more than common chickens, as a rule. Each year the call in this market for genuine, large capons becomes greater. The reason for this is that people are becoming educated to the enjoyment of the luxury.

Looking over the quotations on January 1, we note that large and choice capons sold, dressed, at fifteen cents per pound, while mixed lots brought twelve cents per pound. What are termed "slips" (cockerels that have been imperfectly caponized) sold at from eight to ten cents per pound. A capon will bring upwards of three times as much as a cock. Capons grow to be larger and heavier than cocks and may, if well bred, be made to attain a size of from twelve to fifteen pounds each. A capon of such a weight will sell for from \$2 to \$3, while a cock will not bring more than fifty cents. Yet it costs just as much to raise cocks as to raise capons.

When raising capons the breed should be carefully considered. If the operation is performed early the capon will not develop a comb. The operation should be performed before the bird is three months old. It is a waste of time to use small breeds and scrubs, as they will only sell as second-class stock. The largest capons, according to our information, are produced by crossing a Dorking male with Brahma hens, and the best in quality are produced by keeping the pullets of the Dorking-Brahma cross and mating them with an Indian Game male. The capons so produced combine the size of the Brahma, the compactness of the Dorking, and the full breast and juicy qualities of the Indian Game. Other good crosses may be made by the use of Houdan male, with Brahma, Cochins, or Plymouth Rock hens, or the Dorking or Indian Game may be used in place of the Houdan. The hen should always be

large. The form and quality are mostly derived from the sire. Buyers are not so particular about the color of the legs and skin of the capon as they are of its size and attractive appearance in other respects, yet a yellow legged capon holds an advantage. Yellow legs may be secured by using Plymouth Rock males on pullets that have been produced by mating a Dorking male and a Brahma hen. Such a capon will be of excellent quality and will always bring a good price. Light Brahma males are also mated with Cochins in order to secure large capons, but they do not have that full breast which is imparted by the Houdan, Dorking or Game. If the color of the legs is of no consequence, the Houdan male and Langshan hen produce excellent capons when mated.

A capon grows and fattens on a small amount of food. The first point should be to secure large frames and fatten them after they are fully matured. If the capon is produced from a large breed it should have plenty of time for growth—about fifteen months—for every pound is valuable. The food should be nourishing, but not fattening. Corn is unnecessary until near the time for fattening. Wheat, oats, pounded bone, meat milk and green food, all that it can eat twice a day will be sufficient to help capons rapidly in growth.

Capons should be put in a small yard (not too crowded) three weeks before being sold and fed four times a day, giving plenty of corn and also a variety of other food. One of the best preparations for fattening capons is corn meal and ground oats, equal parts, adding half a pound of crude tallow to every quart of the mixture. Moisten the whole with skimmed milk or boiling water and season with salt.

The comparison of a well-bred, well-kept and well-fed capon with a cock of the same breeding, will show that where a cock reaches ten pounds weight in a given period of time, the capon will weigh one-third more, and the difference in price is three to four times as much. If, instead of keeping the yards full of useless and unprofitable cockerels caponizing were resorted to, there will be a greater desire to have more cockerels hatched than pullets. By keeping good breeds, neighbors may be induced to use the eggs for hatching purposes. Then the surplus cockerels may be bought at a slight advance, as they will prefer to keep the pullets for their own use. By then providing the neighbors with pure-bred males every season there would be no limit to the supply of eggs for hatching cockerels for capons.

Broilers, too, find a ready sale in the Chicago markets. Last April they sold for \$7 a dozen for one and one-half pound sizes, and \$9 in May for choice lots. Chicago has to supply all the surrounding markets, hence it is never overstocked. Chicago is destined to be the greatest market in the world.

P. S. SPRAGUE.

PEKIN DUCKS FOR PROFIT.

Poultry Raising is Now a Trade—Operating Duck Egg Incubators—Proper Care of Breeding Stock—Formulas for Feeding Laying Ducks and Young Ducks.

BY JAMES RANKIN, BREEDER, SO. EASTON, MASS.

IT IS well known by this time that the poultry business is as much a trade as any other department in life, and a man in order to succeed must possess, at least, two traits to qualify him for the business—intelligence and energy. His buildings should be neat and commodious, constructed with a view of reducing the labor to a minimum, also of securing good drainage. Above all, start in with good incubators and good brooding apparatus. Secure first-class stock to start with. Debilitated, degenerate stock will never produce healthy young birds, and it is worse than useless to hatch thousands of young birds that come into the world with enfeebled constitutions and in no condition to live. But there are other sources of mortality aside from this. Cheap and improperly constructed incubators, with greatly varying temperature in their egg-chambers; defective brooders, which mean extremes of heat and cold for the young birds—all contribute their share toward the death rate.

I have never thought that the variety of food given was so responsible for the poultry-grower's troubles as the care, cleanliness and proper control of heat in both hatching and brooding the young birds. It is true that under proper regimen and diet, young birds will grow faster, develop better and weigh more at a marketable age than if the food ingredients were not right, and the old birds will also contribute a larger number of highly-fertilized eggs when the food conditions are right. Our food formula for ducklings in different stages of growth, also for laying and store birds, I will give later on, and confine myself now to the care and treatment of the birds.

OPERATING DUCK-EGG INCUBATORS.

Highly-fertilized eggs should be used, if possible, as it will mean strong ducklings and more of them. See that the heat in the egg chamber is uniform. Use accurate glasses, and place them on the eggs in the center of the egg chamber. Run them at 102 degrees the first two weeks and 103 after the animal heat begins to rise. The eggs should be cooled a little once each day after the first week, and longer after the animal heat rises. A little moisture should be used after the eighteenth day, ventilating a little more towards the end of the hatch. Observing these rules, with a good machine and good eggs, the operator should hatch from 65 to 70 per cent of all the eggs used.

Do not feed your ducklings till after they are thirty-six hours old. Feed four times a day and no more at a time than they will eat clean, in fact, keep them a little short, especially during confinement in inclement weather, as it is an incentive to exercise, which they need in order to assimilate their food. Do not put more than one hundred in a pen; seventy-five would be better. Bed the little fellows, until ten days old,

with hay-chaff or cut straw, then with sawdust (if to be had), as the latter is both a good absorbent and disinfectant. Keep the pens dry and clean, both outside and in. The welfare of the ducklings depends upon this. Be sure to give shade in warm weather. It is not necessary to keep water by them, but give all they will drink, while feeding. The birds should be ready for market at ten weeks old. Breeding birds should be selected from the early-hatched birds (I always select the largest and choicest), handling every one carefully. It is true that the early-hatched birds are worth more in market,

but I must keep them to breed from, as they will develop into larger and better birds than those hatched later, as the cool, temperate weather of the early spring will facilitate their growth and maturity much better than the extreme heat of mid-summer. The birds cost me more, but it is policy in the end, as they reproduce much sooner than the later ones.

PROPER CARE OF BREEDING STOCK.

The birds selected for breeding should be turned out to pasture or in large grassy lots, if possible, and fed on adulterated food. By this I mean bran, Quaker oat feed, with a little meal and grit. About November 1st these birds should be yarded for



MR. JAMES RANKIN.

winter work. The yards should have been previously prepared for their reception. About August 1st, after the old birds are through laying and beginning to molt, they should be taken out of the yards and turned out to pasture. The yards are turned and sowed to barley, which crop serves a double purpose—that of disinfecting the ground and giving a heavy crop of green food for the birds. This green food is cut fine and mixed in their daily rations. When the time comes to yard the birds, this crop has all been cut and the yards are in fine condition for them. These yards are one hundred feet long and the same width as the pens in the building. Whenever we have room, the yards are run out fan-shape, which of course makes them larger. Our green food now consists of green rye, obtained in the way described. As fast as our yards are emptied of ducklings, they are turned and sowed quickly to rye, as this is a crop which resists winter's frosts. We now have about two acres of this rye, a perfect mass of green, about eighteen inches high. This largely constitutes our green food for winter. Just before a snow storm we cut large quantities of it and pile it up in a frozen state in some shady place, where it can be drawn upon at will.

Should this supply be exhausted while the ground is covered with snow, we always have several tons of fine clover rowen, cured for the purpose. This, with a few hundred head of refuse cabbage, carries us through in good shape. I dwell particularly on this green food because it is one of the necessities for the production of strong, highly-fertilized eggs.

Every one knows how necessary green food is for hens during winter confinement, yet it is even more essential for ducks. I now mix fifteen per cent of this green rye, cut fine, with the other food.

I will now give my methods and formulas for feeding the young birds (at different stages of growth) for eggs, also for breeding birds.

FORMULAS FOR FEEDING DUCKS.

*For Breeding Birds (Old and Young During the Fall).—*Feed three parts wheat bran, one part Quaker oat feed, one part cornmeal, five per cent of beef scraps, five per cent of grit, and all the green food they will eat, in the shape of corn fodder (cut fine), clover or oat fodder. Feed this mixture twice a day, all they will eat.

For Laying Birds.—Equal parts of wheat bran and cornmeal, twenty per cent of Quaker oat feed, ten per cent of boiled turnips or potatoes, fifteen per cent of clover rowen, green rye or refuse cabbage, chopped fine, five per cent of grit. Feed twice a day all they will eat, with a lunch of corn and oats at noon. Keep grit and oyster shells constantly by them.

For Feeding at Different Stages of Growth.—The first four days feed equal parts of rolled oats and cracker or bread crumbs, ten per cent of hard-boiled eggs, chopped fine, five per cent coarse sand. Feed four times a day, what they will eat up clean. Brooder heat ninety degrees.

When from four days to three weeks old, feed equal parts of rolled oats and wheat bran, ten per cent corn meal, five per cent coarse sand, five per cent of fine ground beef scraps, soaked finely cut green clover, rye or cabbage. Feed four

times a day. Brooder heat from eighty-five to seventy-five degrees.

When from three to six weeks old, feed equal parts of corn meal, wheat bran and Quaker oat feed, five per cent of fine grit, five per cent of beef scraps. Mix in green food. Feed four times a day.

When from six to eight weeks old, feed three parts corn meal, two parts wheat bran, one part Quaker oat feed, ten per cent of beef scraps, five per cent of grit. Feed three times a day.

When from eight to ten weeks old, feed two-thirds corn meal, one-third equal parts of wheat bran and oat feed, ten per cent of beef scraps, five per cent of grit, oyster shells and less green food. Feed three times a day. They should now be ready for market.

We never cook the food for our ducks after they are a week old, but mix it with cold water.

I wish to emphasize several points again. Do not forget the grit; it is absolutely essential. Never feed more than a little bird will eat up clean. Keep them a little hungry. See that pens and yards are sweet and clean, for though ducklings may stand more neglect than chicks, remember that they will not thrive in filth. If any one fails in this business, it must be through his own incompetency and neglect.

With us it is the surest crop we can grow. Independent of the elements, affected neither by floods nor drafts, heat nor cold, a concentrated cash product turned every three months, it makes the best returns of any crop on the farm.

JAMES RANKIN.



DOUBLE BROODING HOUSE—NORTH SIDE—RANKIN'S DUCK RANCH.

TO HATCH AND RAISE DUCKS.

Selection of Breeders the First Step—Fertility of Eggs—Incubating—Testing the Eggs—Feeding Young Ducks.

BY GEORGE H. POLLARD, BREEDER, SOUTH ATTLEBORO, MASS.

EXPERIENCE teaches that while it is one thing to hatch a duckling or a chicken, it is quite another thing to successfully raise it to maturity in health and strength. It has been said that a child's education should begin one hundred years before birth. To get good hatching eggs and strong, hardy ducklings it is necessary to begin at least two or three generations back in the breeding stock. Many blue days and restless nights caused by puny, sick chickens, and eggs that positively would not hatch, might have been avoided if the reasonable attention had been given to the care and condition of the breeding birds. Exercise is the important point. It is the rule with all animal life that exercise conduces to vigor, and vigor means added transmission of vitality. Eggs from closely yarded and carelessly kept birds can not produce results which will justify the time and expense expended in the effort to profitably use them. Success may come for a season or two, but the end is disastrous as many a would-be poultryman has learned to his cost. The first point then in incubation is that the eggs be from hardy, vigorous breeders kept in such a manner that they may have open air exercise, green range, a water-run if possible, and that they be so housed and fed as to retain, as much as can be, the stamina inherent in all fowls kept under natural conditions.

FERTILITY OF EGGS.

In breeding ducks—other things being equal—it will be found that a water range will conduce very materially to a greater fertility in the eggs, and to a stronger and more healthy germ. The extra early eggs run very infertile at best, and any considerable percentage of hatchable eggs must not be looked for before the latter part of February or the first of March. We have lost the sale of a great many early eggs for hatching through making this explanation, but have generally gained a customer after the inquirer had tried some eggs from those who claim to produce duck eggs that will hatch well in December and January. There are various ways of figuring the fertility of eggs. Many sellers divide them arbitrarily into two classes, fertile and infertile, and of course this is exactly true, but there are often cases when ninety per cent of the eggs will be fertile, yet there will be a hatching possibility of not more than sixty or sixty-five per cent, sometimes even lower. This is due to the early death of the germ, which can hardly be said even to begin to develop before dying. While these may, strictly speaking, be classed as fertile eggs, practically they are worthless and serve only as a catch for customers who do not know. The safe way is to figure the percentage of strong living germs after the first test and use that as a basis for your expectation of good or bad results.

Eggs that produce from sixty-five to eighty per cent of this degree of fertility, according to the season, are good, seventy to seventy-five per cent being excellent. Ordinarily it would be as well to look twice at an offer of over eighty per cent at any season. If this does not read like many of the advertisements we really can not help it.

Eggs should be carefully handled, but that does not necessarily mean that we must fuss with them. Keep them as near sixty degrees in temperature as is convenient, and if they are to be kept many days they should be handled over once or twice a week or their position so changed that the yolk shall

not remain in exactly the same spot. If not clean when gathered (it is hard to keep duck eggs perfectly clean, especially in wet weather), they should be washed in lukewarm water, and in cold weather carefully dried with a cloth. In warm weather the water may be left to evaporate. Some operators condemn washing, claiming it destroys the natural coating of the shell and injures the hatching chances. We have not found it so, and believe nearly all extensive operators wash the eggs.

OPERATING THE INCUBATOR.

If they are to be hatched under hens there is not much to be said as to methods. Nearly every one has his or her favorite way and uses it with more or less gratifying success—when the hen is willing. If hatched

in incubators there is much to say, and lots that has been said. Beginning with very little more knowledge of incubators than we had of electric motors, we got about as satisfactory results as if we had run against a dynamo on a wet day. There were as many different theories as operators, and moisture and ventilation were the questions of the hour. We began with four Monarch machines, large size. The first season we used the four pans provided for moisture, and introduced them with considerable precision. The result, while not satisfactory was largely due to the poor quality of the eggs.

The machines were located in the cellar of our dwelling house, and the cellar was cemented and contained a boiler for steam heat, the steam pipes radiating in different directions. This dry cellar, we were told, called for more moisture than an outside cellar, uncemented and without the furnace. As we gained a little confidence in the value of our own headwork we began to question the need of so much moisture and dropped one pan, running only three of the four, at that time sent out with each machine. We knew that some of the experts said the moisture was necessary to prevent too rapid evaporation of the contents of the shell, and also to rot the shell to make it easier for the duckling to break out. When we investigated after each unsatisfactory hatch we found many



MR. GEORGE H. POLLARD.

shells packed full of apparently healthy and fully developed ducklings, which were unable to turn their heads or to make the slightest motion to release themselves from their prison walls. Reflection seemed to teach us that this was all wrong.

We still further reduced the moisture, and while the hatches, as before, were unsatisfactory, we found fewer packed shells and less ducks with bills protruding through the shells, hopelessly cast. Finally getting to the proper pitch of desperation we ran one hatch throughout without any moisture, and to our gratification found we had quite as good results as when we had used it, and we had saved a great deal of trouble in trying to guess when to put in the moisture and how much to use.

VENTILATION.

The ventilation gave us more severe wrenches, and we ran the gamut from shut close to wide open, and it did not seem to make much difference in results. We could not find any one who could definitely explain the mysteries of ventilation

which the egg is held. A piece of thick, black woolen cloth is tacked over the hole in the box, and a hole made in the cloth about two thirds as large around as the egg. This stops any side rays from the lamp and sends a stronger light through the egg. We prefer this box and lamp to the smaller and lighter weight testers which are to be had ready-made, because it is heavier and less easily displaced or upset. When one has several thousand eggs to test there is work enough without adding unnecessary care.

The infertile eggs are perfectly clear inside, or show only a very slight shadow, which is the yolk. When the germ begins to develop there is a small dark spot on the inside of the egg which floats about as the egg changes position. This develops rapidly, and by the fifth day may be plainly seen as a dark central point from which radiate dark lines, resembling more than anything else a small spider in the center of a web. Some of the eggs will be cloudy and opaque; these are rotten and useless. Still others have a dense, black spot half as big



This photographic reproduction shows breeding house and runs for Pekin ducks owned and recommended by Mr. Pollard. Each yard is part water, as he advocates letting breeding ducks swim. The division fences are about three feet high.

and we finally settled down to running nearly wide open till pipping time and then closing the ventilators nearly shut, in order to retain the moisture which came from the newly hatched birds. This prevented the inner membrane of the shell from drying and sticking to the ducklings.

We have not felt it so very important that the temperature should be absolutely unvarying. We aim to keep it at 102 to 103 degrees, and if it runs to 105 degrees at hatching time we feel no alarm. We once had a strong prejudice in favor of hot-water machines, but a few doses of Cyphers' incubators, taken at regular intervals, have removed this prejudice. We have found the almost exact temperature without care, and the relief coming from absolute inattention to moisture and ventilation which the use of the Cyphers incubator affords is a very great advantage over anything we have hitherto known.

However, all rules have their exceptions and we believe no hard and fast system of procedure will insure perfect results, and that to be successful, brains must be mixed with the business.

TESTING THE EGGS.

We generally test duck eggs the fifth day, removing all infertile eggs and dead germs. We use a tester made of a box, inside of which we set a lamp with a reflector so placed that the light is thrown through a hole in the side of the box against

as a dime, and some show rings of black or red. These are dead germs and should be removed.

About the twelfth day we make a second test. A little practice will readily teach which are the growing germs and which are the dead ones to be taken out. The infertile eggs from the first test may be sold for culinary purposes and are equally as good as fresh laid eggs, the only perceptible difference being a slightly thinner yolk.

When the eggs begin to hatch let them strictly alone. Do not try to turn the pipped sides up, and above all do not open the machine every few hours to see how they are getting along, or to show some inquisitive friend how cunning the little dears look coming out of the shells. After the hatch is fairly well over and the ducklings nearly or quite dried off, open the machine and quickly take a tray out and cover with a thin woolen cloth. Look the eggs over carefully and if any are discovered cast in the shell, or with head lightly caught, break away enough of the shell to allow the little bird some freedom of movement and return the tray. Frequently these birds will break through and prove as lively as those earlier hatched. Do not, however, help too much. There is always a percentage of ill-hatched chicks that live only long enough to count one hatched and then die with their duty fully done.

Leave the ducklings quiet in the machine from twelve

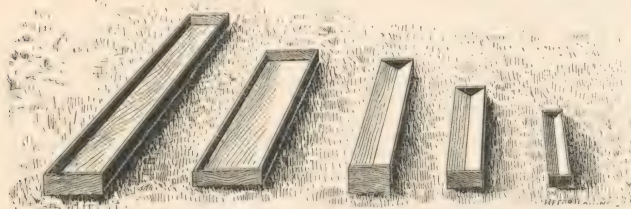
to twenty-four hours after hatching; thirty-six hours will not hurt them. If the ducklings are to be raised in small brooders they should be warm and running properly a few hours before putting in the birds. Explicit directions are generally given with the brooders and we need here only advise the best procurable, and that there be not too many put in one brooder. Fifty is the limit for good results, and fewer will thrive even better than that number. We are well aware this advice will be wasted on many of our readers, and they will try the old scheme of putting more together till experience teaches them that it does not pay. An expert may, and often does crowd many more into a pen, but the experienced eye is quick to detect the first sign of *going bad* and the fault is quickly remedied. Even then the chicks suffer from the practice and make a less perfect growth. The general conditions are the same in a piped brooder house as in a small brooder. There is simply more of it.

The heat under the hover should be about 95 degrees when the ducklings are put under from the machine. The animal heat from their bodies will raise the temperature several degrees in a small hover. Keep the heat from 90 to 95 degrees for the first three days, after which it may drop to 85 degrees in cool weather and 78 to 80 degrees in warm weather. Ducklings do not require so much heat as chickens. The floor of the hover and pen should be littered with sawdust, fine shavings, chaff, or cut straw, or it may be covered with fine sand or gravel.

The little birds should be penned back near the hover at first, that they may not lose the source of warmth and get chilled. This we do by placing a narrow board across the pen about twelve or fourteen inches from the front of the hover. The second day move it a little farther away and so on until about the fourth or fifth day they may have the full run of the pen. Care should be taken that at night they go under the hover and do not bunch up in an outside corner until they are old enough to decide for themselves what is best. After a week or two, in warm weather, they may choose which they prefer. In colder weather it will be longer before they forsake the hover.

FEEDING YOUNG DUCKS.

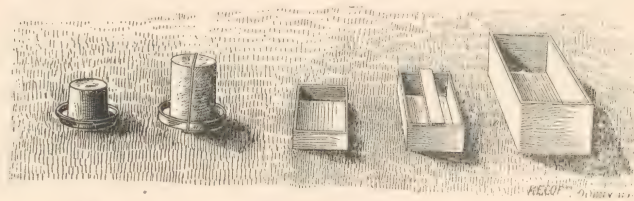
There are various methods of feeding, either of which may be used successfully. We have put aside all the boiled egg and bread crumb formulas and feed simple, easily prepared foods, and get good results. Their first meal is a mixture of two-thirds wheat bran and one-third corn meal, into each quart of which we put a handful of fine gravel, and mix to a moist condition with milk—either whole or skimmed; or we add two well-beaten eggs for each quart of the mixture, and mix with water. They have this food before them at all times the first three days beginning as soon as they are put under the hover. It is fed in either small plates or troughs. See illustration. How it is fed does not so much matter.



FEEDING TROUGHS FOR PEKIN DUCKS.

Water is before them in small fountains, cuts of which are shown herewith. Often if they are backward about beginning to eat or drink, if one or two have their bills gently dipped in the water it will start a general thirst in the whole flock. A little chaff scattered on the surface of the water will answer the same purpose, as in picking at the chaff they get a taste of the water. Many breeders feed only at stated times from the

beginning, but we have found it saves time and trouble, and the ducklings do quite as well, when we leave the food before them. After the third day they are fed four times a day, rather more than they will clean up at once. From the first they have water during the night as well as the day. It is one of



DRINKING FOUNTAINS USED BY MR. POLLARD.

the prettiest sights of the whole business to see a string of downy, little, yellow chaps travel to and from the water fountain in a moonlit brooder building. They glide like quaint, little shadows and converse in quiet little peeps of contentment.

The food is strengthened as they grow and when five days old they have an addition of five per cent of beef scrap and the eggs are dropped or the milk omitted. The beef scrap is gradually increased until at three weeks old they are getting ten per cent and at five weeks twelve per cent. The grain is equal parts bran and meal with enough flour added to make it hang together so as to save waste by throwing about while eating. Green food, such as grass, rye, clover, etc., is run through a clover cutter and mixed in the soft food which is slightly salted and is wet up with cold water. After the fifth week they are fed three times daily and only what they will clean up at once. Gravel or grit is before them at all times and much care is taken that they may not be frightened or worried. Naturally of an exceedingly timid disposition, quiet is an essential part of the treatment for quick growth. The green food is not necessary except the birds are to be developed for breeders. Yet it may be used to reduce the grain bills. The ducklings need only drinking water, and if quick growth for market is desired they should not be given free water range, at least not before being fully feathered.

WEANING COOPS FOR DUCKS.

After the fifth week in spring and the third week in summer the ducklings may be removed to cold buildings, and will grow better without artificial heat. Of course this will not do before March or April. The houses need be only the plainest of sheds but should be dry. After the first of June birds six weeks old may be penned in the open air with merely a shed roof, or brush shelter from the sun. From the egg up they need and must have convenient shelter from the sun's rays. Probably more young ducklings are lost from lack of suitable shade than from any other cause. Overheating causes leg-weakness, giddy, whirling spells, and spasms—and ends in the bird throwing itself on its side and dying. While the shade is an absolute necessity they must also have a chance to get as much sun as they require. They will suit themselves according to their needs where sufficient opportunity is provided.

While at first they are watered in the small galvanized iron fountains, when about three weeks old they are given a plain open trough, of a suitable size. As they grow, the size of the trough is increased. There are many patent appliances and more expensive methods, but for care and efficiency we have found no better way. Where the plant is large, water may be pumped by steam or windmills and conveyed in pipes to the yards and directly to the troughs. With the great majority, however, who raise ducks it must be a case of pumps and wells and carrying water, and these hints are rather intended for such than for those having extensive and completely equipped plants.

There should be yard room equal to thirty by fifty feet for each fifty birds to get the most out of them. Too much range is not desirable for market ducks, as they do not take on meat so rapidly. Many, about the seventh week, begin to make a gradual change in the food, adding a large proportion of meal. We have found we can get a maximum weight and size by using only the same food as fed after the fifth week, and the bird is not worried by changes of diet. We believe, however, that no one method can be chosen that will always be the best. Circumstances and conditions must determine which is best, and which is most avoidable in given cases.

Cleanliness is an important factor, for while ducklings will stand more filth than chickens it will not do to presume on this point. The brooder pens must be kept clean and sweet, and as dry as possible. There will always be wet places around the water fountains and these do no harm, but the dampness must not be allowed to spread over the whole pen, and the hover must be kept clean and dry. We find fine, dry shavings the best litter, but sawdust is fairly good. Chaff and straw get wet too quickly and retain the moisture too long. The yards should be kept decently clean, and scraping and sweeping may be resorted to to effect this end.

The one serious vice is feather pulling, and some flocks develop this mania to an alarming extent. We know of no

way to effectually stop it when once begun. We try to divert their attention by giving them, if possible, a green run and sometimes we feed an extra allowance of beef scrap for a few days. It is generally more often developed in large crowded flocks than in the smaller ones. Of special diseases we know none, and raising ducklings may be classed as the simplest problem of the whole poultry business. Yet they must have care and attention or they will not thrive and they will leave a legacy of grain bills that will surprise the novice.

When carefully fed and cared for they will be ready for market at from ten to twelve weeks old, according to their feathering. If allowed to run over twelve weeks they become very pin-feathery and should be allowed to go till about the sixteenth week when they will have their new feathers and will have gained from one to two pounds in weight. At ten weeks good birds will dress from ten to twelve pounds per pair and will average from ten and one-half to eleven pounds. Beware of the breeder who claims averages of thirteen pounds per pair and upward. Like the poet's maiden "He is fooling thee." They do not grow. An occasional pair out of a thousand may reach fourteen pounds, but there are many more that reach only nine pounds. The best and most desirable markets call for birds weighing from nine to twelve pounds per pair, dressed weight.

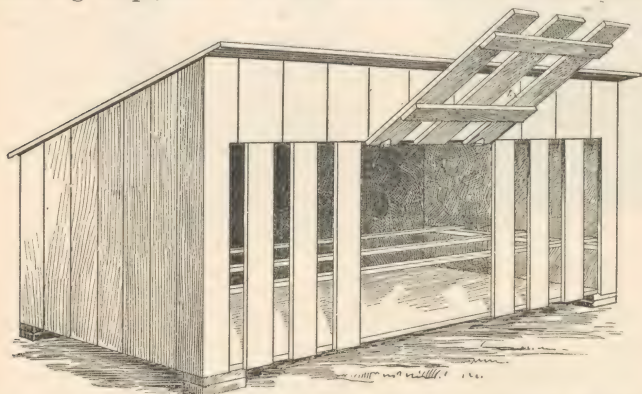
GEO. H. POLLARD.

PRACTICAL COOPS FOR GROWING CHICKS.

FRESH, COOL AIR AT NIGHT.

The important thing in summer is to keep the young stock growing steadily and rapidly. Give them all the range you can; feed good, wholesome food; provide shade for them, and, last but not least, furnish them cool, comfortable quarters at night.

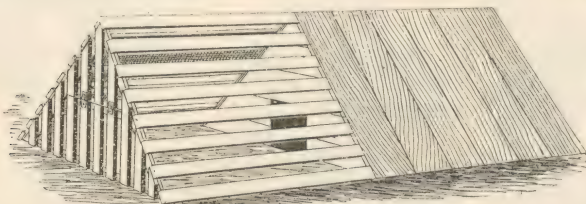
The best plan known to poultrymen is to have out-door roosting coops, similar to the one shown in the illustration



herewith. The exact shape cuts no figure. It should be large and airy. Build it open on one entire side, so that it will be sure to be cool. If threatened with varments of any kind, nail the slats close together, or use wire netting. Place coops like this in convenient spots, some distance apart, and put twenty-five chicks in each, not more. Coop them up two or three days till they learn where they belong, give them range, keep the coop clean and they will thrive apace.—*From Reliable Poultry Journal*.

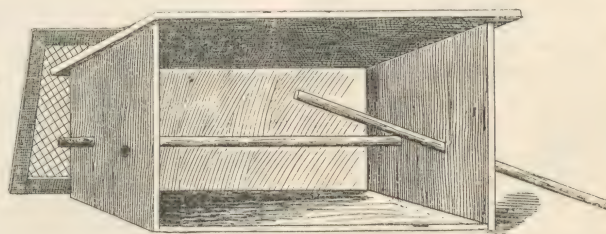
BROOD AND WEANING COOP.

Herewith is also shown the favorite brood coop for a hen with chicks, in use by an eastern poultryman. This coop pro-



vides shelter for the hen and chicks gives the hen an open air space in which to exercise and allows the chicks free range. A slide door made of closely woven wire mesh should be provided for securely locking the hen and chicks in the closed half of the coop during the night. An illustration is also pre-

sented of a weaning coop in use by the same man. This coop is used for the chicks after they are taken from the hens, thirty to forty being placed in a coop 3x6 feet in size, floor measurement. The roost poles in this coop extend through the



ends of the coop and serve as handles to move the coop from place to place. These poles are removable, as shown in the illustration, for oiling, cleaning, etc. A wire frame that fits snugly into the front of the brood coop is buttoned securely in place during the night, after the chicks have gone to roost.

FOR WEANING AND COLONIZING CHICKS.

When spring opens up and the grass begins to shoot, all the older chicks are removed from the brooding house and scattered over this farm in thirty-five so-called weaning houses, as shown in the accompanying illustration. These houses are 5x7 feet in size, floor measurement, five feet high in front and three feet high in the rear. There is an ordinary door in front and a window with a double glass sash, one sliding each way, also a stout wire screen back of this for summer use. The exit



WEANING COOP IN USE ON FISHER'S ISLAND FARM.

is in front, as shown in the illustration, and is closed securely at night by use of a sliding door. Fifty chicks are placed in each house and given from a quarter to a half an acre of range. Each space is inclosed by a six-foot wire fence. This fence is built of ordinary two-inch mesh wire netting simply strung between posts.—*Reliable Poultry Journal*.

BREEDING AND FEEDING PEKIN DUCKS,

As Practiced on the Atlantic Farm—Warmth of Brooders—Shade—What to Feed and When.

BY A. J. HALLOCK, BREEDER, SPEONK, LONG ISLAND, N. Y.

AS we have no excuses or apologies to make for this contribution to duck literature we will proceed to do as requested, that is, to give our method during the past season.

Brooding comes first but is no more important than feeding. They must go together for if either is neglected, it will be felt in every nook and corner of the farm and the hardest blow will fall on the pocketbook of the owner.

As soon as the ducklings are thoroughly dry they are taken from the incubator and placed in the warmest section of the brooder, where the temperature under the hover is about 90 degrees and that of the room about 80 degrees. The pens in this section are 7x10 feet including the hover, and the hover is 2x7 feet. Three one and one-fourth inch hot-water pipes run through this brooder about six inches from the floor. The floor is earth and is covered with hay or straw to the depth of about one inch.

Fifty to one hundred ducklings are kept in these pens, the number depending upon the quantity of ducklings on hand. If it is mid-season and everything is full we put in the larger number; but if it is the first or the last of the season the smaller number is left in them. They are kept here from one to three weeks. The time depends upon the above conditions and the weather. If it is cold they stay here longer than in warm weather. In this section they have no outside runs and are not allowed outside at all as it is too cold in the winter, and during the summer it requires too much attention to keep them from getting hurt by the sun.

From here they go to a room that is slightly cooler (70 to 75 degrees) and with outdoor runs 6x50 feet. Here they are gradually hardened by having free access to the outdoor runs, as their next step forward is to the cold brooder. They are not forced to stay outside if the weather is not warm enough for them to be perfectly comfortable. When they show signs of being chilly they are immediately driven into the brooder, as they do not have sense enough to go in themselves. When in this section they are always fed outside unless it is very stormy. After they have been here from one to three weeks

(the time depends on conditions before mentioned) they are placed in the cold brooder, or if the weather will permit they are given the water runs, which are 26x140 feet with one end extending about 40 feet into a stream of spring water. These pens hold one hundred and fifty ducks, and they have access to the water day and night in warm weather, but during the day only in April and May weather. And here their education is finished. When they leave here they go to the market or the breeders' pens.

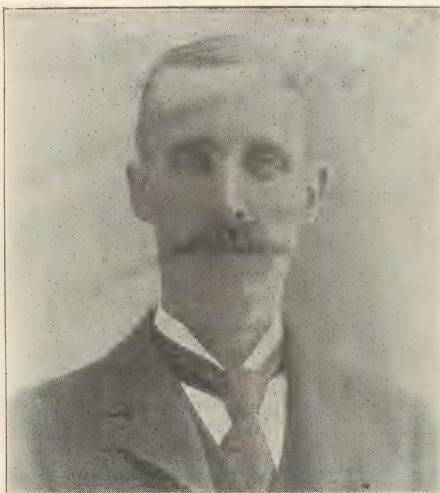
It is absolutely essential to success to keep the ducklings

warm and comfortable, and their quarters clean. Ducklings that are not kept warm enough can not grow and have a thrifty, healthy appearance; they will be far from it. They will have, we will call it rheumatism for want of a better name. The symptoms are: The beaks get very pale and soft and grow faster than the ducks. They stand around in a listless manner with backs humped up, and the down standing out straight. The feet and legs get colorless and stiff and in severe cases they lose control of them entirely. When in this condition the cheapest and quickest cure is a good sharp hatchet applied to the neck. When they have not had sufficient grit and have indigestion they will show some of these symptoms but not all of them. In fact, a duckling's down will always stand up when it is not perfectly well and happy. On the other hand they must not be kept too warm.

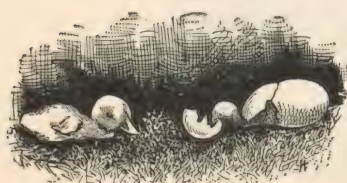
The extremes are to be avoided. We can have "no cast iron rules." It is necessary to exercise a little judgment. With a bit of close observation any one can soon tell at a glance whether everything is right with the ducklings.

Shade should not be overlooked. If the ducklings are not well supplied with it many of them will be killed by the sun if they are not carefully looked after and driven into the shade when necessary. Ducklings have a very poor supply of what is called common sense. They will sit down in a sunny spot and stay there until they are so overheated that many of them will die on the spot, and others get so weakened that they drop off in a day or two.

It is here that a careful attendant



MR. A. J. HALLOCK.



HALF OUT THE SHELL.

Weight, 2¾ oz.

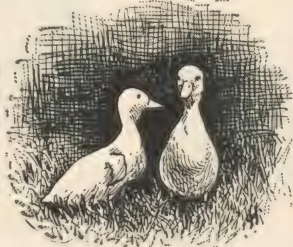
ALL OUT THE SHELL.

Weight, 2½ oz.



ONE WEEK OLD.

Weight, 3 oz. each.



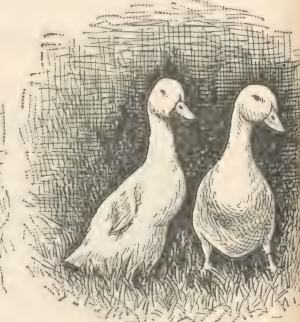
TWO WEEKS OLD.

Weight, 5½ oz. each.



THREE WEEKS OLD.

Weight, 7½ oz. each.



FOUR WEEKS OLD.

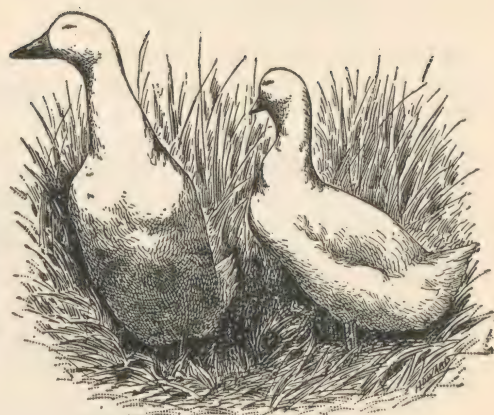
Weight, 1 lb. 3 oz. each.



FIVE WEEKS OLD.
Weight, 2 lbs. 6 oz. each.



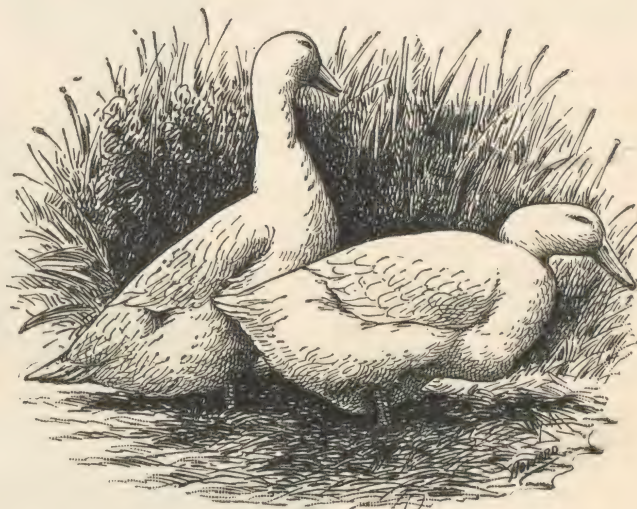
SIX WEEKS OLD.
Weight, 3 lbs. 12 oz. each.



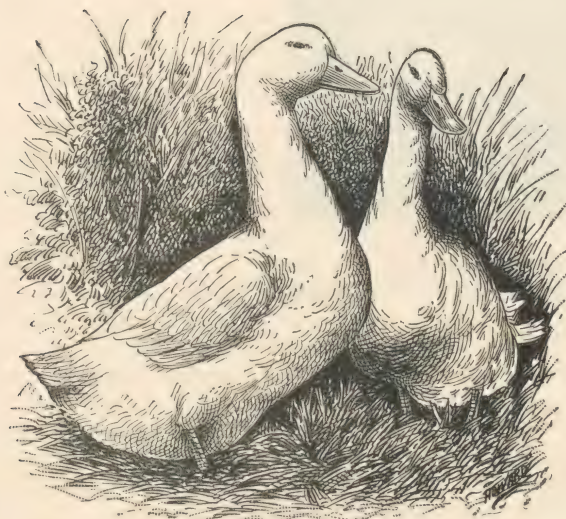
SEVEN WEEKS OLD.
Weight, 4 lbs. 12 oz. each.



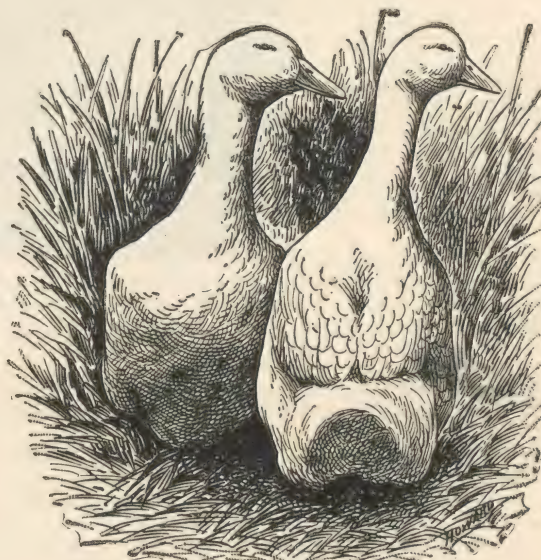
EIGHT WEEKS OLD.
Weight, 6 lbs. 2 oz. each.



NINE WEEKS OLD.
Weight, 7 lbs. 4 oz. each.



TEN WEEKS OLD.
Weight, 8 lbs. each.



ELEVEN WEEKS OLD.
Weight, 9 lbs. 3 oz. each.

will save many ducks. After they are four or five weeks old they will learn to find the shade.

The next important item is the food. During the first week we feed equal parts of cornmeal, bran, No. 2 flour and about ten per cent coarse sand or grit, thoroughly mixed with enough water to make it moist and crumbly. Feed four times a day—soon after sunrise, at ten o'clock, two o'clock and a little before sundown. The food is put on beef scrap bags. We find these are better than boards or troughs for the little fellows, as it is easier for them to get the food, it does not get scattered in the pen, and if there is any left it is easily cleaned off. When the bags get soiled they are washed. The ducklings have all the water they will drink with each feed. The troughs are large enough to furnish water to them for an hour after feeding without refilling. They are V shaped, about four feet long and two inches deep.

The second week the ducklings receive the same grain ration with eight per cent beef scrap added, and if it is convenient to get some tender, green grass we make the feed about one-fourth of this; but unless it is tender and easily digested it is best to use none at all. After the fourth or fifth week and until the seventh or eighth week we feed three times a day the same ration with an increase of scrap to ten per cent. After the ducks are eight weeks old, if they are intended for market

we feed five parts corn meal, one part wheat bran, one part No. 2 flour, one part greens with twelve per cent beef scrap. A box of shells or grit is kept in every pen. Each ration is thoroughly mixed with enough water to make it moist and crumbly. There are enough troughs in each pen for all of the ducks to get around at one time without serious crowding. Ducks of different ages are not allowed in the same pen, because the strong would trample on the weak and the result would be stunted ducks with but one meaning—no profit.

We have a regular time for feeding and when that time arrives all else is laid aside. The one rule on the Atlantic Farm that the men must not overlook is, that the ducks are first and all other work must be dropped at feeding time. When the ducks need any attention whatever, it is absolutely necessary that they have it, and it makes no difference if it be noon or midnight.

In regard to the cuts printed herewith we wish to say that these weights are not the average. We selected the very best ducks we could find at the time. They were all weighed the same day and they were taken from eleven different pens, ranging from one to eleven weeks old. They were weighed after feeding. However, they did not receive any extra care. They were fed and cared for just the same as all the other ducks on the farm. And there were more like them.

A. J. HALLOCK.



PAIR OF ATLANTIC FARM PEKIN DUCKS.

[Reproduced from a Photograph.]

USE OF THERMOMETERS IN INCUBATORS.

BY CHARLES WILDER, MANUFACTURER, PETERBORO, N. H.

THE right use of heat in incubators is the key to success. All other conditions may be perfect but, if the heat is wrong, the hatch is a failure. To get and keep the right degree of heat a measure of heat must be had.

The measure must be accurate, constant, simple, easily used. That measure is the thermometer. Thermometers do not create, change, modify, or control heat. They simply register heat, rising and falling as the heat changes, telling at once each change with precision. There need be no difficulty in getting thermometers that are accurate and will remain so. To attain uniform accuracy thermometer tubes should be made about one year before being tested, as they are liable to rise nearly one degree in reading from the shrinking of the bulb, during one year after the tube is made. No further change will then occur. To be sensitive thermometers must have bulbs of even thickness, not too large bulbs, as a large bulb thermometer must be more sluggish in action, and is much more easily broken. Good incubator thermometers can only be made by the best workmen, who have the skill to make bulbs of regular size and thickness without having to melt back the bulb several times until the glass "burns out," and the bulb is made rough and weak and easily broken.

To be easily read, thermometers must have the degree marks wide apart. This compels the use of a fine bore tube, as mercury has not enough power of expansion to give a wide degree space with a large mercury column. To magnify this fine mercury column, a "lens front," or magnifying tube is sometimes used. While this kind of a tube is valuable in clinical thermometers that can be held up to the eye to focus the column, it is not safe to use in an incubator where the thermometer lies in one position, must be read from a distance, and any error in focusing the column is magnified by the lens from tube.

To be simple, so that people not experts can use them easily, thermometers should be adjusted correctly, and have no adjustments or attachments except those sent with incubators. The form of an incubator thermometer is not essential. There are about sixty patterns of thermometers now used in incubators. Nor is the material from which thermometer scales are made essential. Some of the first incubator thermometers used in this country were made in Germany, where—on account of its cheapness—wood, instead of metal, was used for the scales. These were quickly superseded by the much more accurate and nicely made American thermometers. But there is still among a few operators of incubators a vague idea that somehow a wood back is better for an incubator thermometer than a metal back. There is no good ground for this. The writer has made thermometers for thirty-eight years, has a personal acquaintance with over fifty manufacturers of incubators, has been to their factories, some of them several times,—has studied the construction of their incubators, methods of application, diffusion, regulation and circulation of heat, their ventilation, use of moisture, and methods of using thermometers, and is fully satisfied that there was never an egg that could be hatched artificially by the use of a wood

scale thermometer, that would not hatch equally well by the use of a white scale metal thermometer under any possible conditions. After making incubator thermometers with scales of wood, tin, zinc, bronze and brass, finishing natural color, black, and silvered, our conclusion, based on a lifelong experience, is that the most legible, accurate, practical incubator thermometer is one with a white metal scale. But the color of a thermometer scale may affect its action. As black absorbs heat much more readily than white, we regard black scale thermometers as unsafe to use in incubators.

LOCATION OF THERMOMETER IN INCUBATOR.

The position of the thermometer in incubator—whether it stands up, lies down, or lies inclining, does not sensibly change its action, if thermometer is properly made. The location of thermometer—where but one is used in an incubator—should be as near the center of the egg tray as it can be and be seen from the front. Where two thermometers are used in one tray, place them a few inches from each end of tray, as far back as they can be easily read. Of course location of thermometer must also depend on the construction of the incubator.

Formerly in using thermometers in incubators it was the general practice to have the bulb touch the egg. For several years the writer has advocated using thermometers in incubators without touching the egg. While this will at first thought seem revolutionary to those who have always used thermometers in contact with the egg, we believe it is the correct method to use thermometer without touching the egg. Several makers of incubators have already adopted this

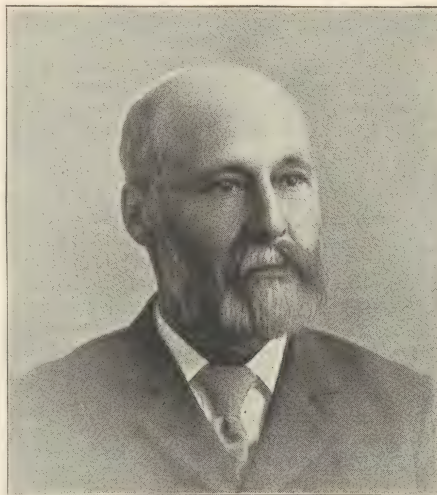
practice, and we predict that it will soon be the general practice. This conclusion is based on the following reasons:

First—The well known difference in heat during incubation, between a fertile and an infertile egg.

Second—An egg may be "alive" when thermometer bulb is placed against it, and a "dead" egg a few hours later and before changing position of thermometer. As the dead egg cools, to maintain heat at 103 degrees the heat of egg-chamber must be raised, so that a large number of live eggs may temporarily be subjected to excess of heat, because of cooling of thermometer by a dead egg. While this might not prove destructive, it would have that tendency. Evidently the true method in incubation lies in eliminating, so far as we can, possibilities of failure, rather than in taking doubtful chances of success.

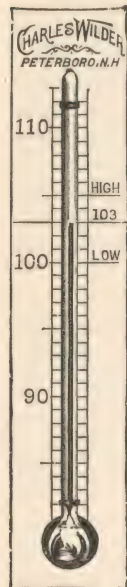
Third—The difference in heat of the same egg at different stages of incubation is well known. While this is sought to be provided for by change of heat in later stages of incubation, the fact that incubation does not progress uniformly in all eggs, makes this increase of heat to some degree a factor in the case, as the most rapid evolution of heat in the egg occurs at the time the embryo is quickened, and there may be a difference of one day in the time of quickening of different eggs, and so a marked difference in heat.

Fourth—There is a decided difference in heat of eggs at the same stage of incubation owing to difference of vitality. To subject an egg of strong vitality to the heat of an egg of weak vitality—or the reverse—during entire period of incubation, might destroy one of them. As, in practice, this does not occur where position of thermometer is changed daily, what does, or may occur, is, that one day the machine is run by an egg of low heat, the next day by an egg with a high heat, so that really instead of a uniform heat day by day, the heat of the



MR. CHARLES WILDER.

egg-chamber may vary several degrees one day with another, when presumed to have a uniform heat. This conclusion, of course, assumes that the thermometer with the bulb in contact with the egg records the heat of the egg it touches, which is the theory upon which the thermometer is used in that position. If it is claimed that the reading of thermometers is not controlled, only modified, by having bulb in contact with the egg, then the argument for having bulb touch the egg loses its force.



Fifth—If it be true that the egg, after the quickening takes place in incubation, observes the law of other animal life, of a daily ebb and flow of heat, that may be given weight so far as it bears on the egg case. This is not offered in evidence, only a suggestion.

From above premises we deduce these conclusions:

First—In artificial incubation the end to be sought is to establish and maintain that degree of heat which will hatch the largest number of eggs under the diverse conditions which those eggs will develop during incubation.

Second—In the nature of the case the exact conditions to be observed to attain this result can not be predicted with certainty, owing to the fact that the vital energy contained in the egg is not now apparent, but is to be developed by the conditions we are to establish to develop that vital energy.

Third—Because of the diverse conditions which develop in eggs during incubation, no fixed law can be made that will produce results with equal certainty. So acting upon the law of averages of results experimentally obtained, practice and experience have shown that in artificial

incubation a heat of 103 degrees in general, varying according to period of incubation, will give the best average results.

Fourth—It follows naturally that success in artificial incubation is not best attained by bringing one egg to 103 degrees and keeping several hundred other eggs of different degrees of vitality to the heat of that egg, for the whole period of incubation; nor by applying thermometer each day to a different egg, so that there will be twenty different standards of heat during one incubation, but, rather, by maintaining an equal diffusion of heat at 103 degrees in the egg-chamber by a thermometer with a free exposure of the bulb, and allowing individual eggs to maintain such degree of heat as their varying vitality develops. The eggs will then be found to vary several degrees in heat with a uniform heat in the egg-chamber.

To try to bring one hundred or five hundred embryo chickens of different vital conditions to the heat of an individual chicken is contrary to nature. Chickens, like men, must have room for their individuality. If in hatching, one chicken develops 106 degrees and another one but 100 degrees, to place a thermometer on the 100-degree chicken and try to make the 106-degree chicken hatch at 100 degrees he might not hatch at all. The same failure would result to place thermometer on 106-degree chicken and try to make 100-degree chicken hatch at 106 degrees. But place both eggs in a tray where the heat is 103 degrees and both may hatch.

In this, as in other things, it is not ours to say that natural law shall be changed to meet results we wish to attain, but it is our duty to so conform our methods to the operation of natural law that we shall not fail of success by attempts to change the physical forces.

Whatever the position of thermometer in the incubator, place the bulb as near the level of the top of the eggs as possible, and get a free exposure.

ACCURACY OF THERMOMETERS.

Of course, if thermometer is not accurate, it will not show good results in the hatch. It is so easy when, for any reason, the hatch fails, to lay failure on the thermometer, that this is often done without reason. Incubator makers know so well the need for good thermometers, that, with very few exceptions, they are careful to get the best thermometers that can be had, so that in buying any standard make of incubator purchasers can feel sure of getting good thermometers, and that they need have no care about any "tests" or "adjustments," because their thermometers have already been tested and adjusted better than any one can do it outside of a thermometer factory. It is one of the marvels of the triumphs of modern skill, that thermometers so sensitive and accurate as incubator thermometers are now made—practically standard instruments—and are sold for less than one dollar each.

As, in the nature of the case, an incubator thermometer must have a fine mercury column, that column is liable to become

divided by a sudden jar, in falling, or by mail transportation. This is in no way a defect. When the mercury column gets divided, a few quick jerks with thermometer held bulb end down, will usually unite it. If this does not do it, tie a stout string to top of thermometer, and swing it quickly round a few times. If this fails to unite the column, thermometer is probably cracked. When the mercury column all rises to top of tube and remains there, the bulb is cracked and thermometer is useless. Each thermometer is an individual, each tube is made and tested, and then the scale is made to fit that tube, so broken incubator thermometers have no value to repair.

Constantly, promptly, accurately the little instrument does its work, often rousing the ire of the operator because it tells just the heat that exists, and not the heat the operator thinks ought to exist, evoking censure because of its truth.

EFFECT OF VENTILATION AND MOISTURE.

The apparent heat of the incubator and its actual heat are sometimes quite different. This puzzles many operators, and is usually the result of errors in operating. The cause may usually be found in defective or excessive ventilation. Where an incubator is given excessive draft, it must have an excess of heat to supply the waste of heat. It will also have an unequal distribution of heat, and the varying currents of air will cause thermometer to act in an eccentric way. If in a dry place the excessive ventilation will tend to evaporate the natural moisture of the egg, and water must be supplied to furnish moisture. Rapid evaporation will be induced, and (especially if the draft be then partly closed) moisture will collect on bulb of thermometer, and as this moisture evaporates from thermometer bulb it lowers the reading of thermometer, so that while the heat of the egg-chamber is too high, the thermometer registers too low from being made a hygrometer for the time by the excess of moisture induced by the unnatural conditions under which it acts. A similar result might be produced by placing incubator in a damp cellar when the draft was properly regulated. Thus for the time two opposing conditions exist, both of them harmful to incubation. The thermometer is not in fault, it simply acts in an unnatural manner, because subjected to unnatural conditions. Regulate the draft and moisture properly, and thermometer will show correct heat, but it can not show heat correctly when forced to act hygromatically, as a wet bulb thermometer.

TESTING THERMOMETERS.

The thoughtless inquiry is often made whether incubator thermometers are tested, which is the same as asking whether salt has been salted, or sugar sweetened, or vinegar soured. All thermometers have been tested. Until they are tested they are not thermometers at all. But in this, as in other trades, the value of the product depends on the care and precision with which the work is done. The reputation of the maker for faithful work in other lines of trade must be the guaranty of the incubator trade that faithful service is being done for them in making their thermometers. It may well be questioned whether in the wide range of American skilled labor there is anywhere so much careful, painstaking work by the best class of skilled workmen, for so little money, as is being done for the incubator trade on their thermometers. The incubator makers are generally taking good care of their customers in this regard.

From the nature of the use of thermometers in incubators, only mercury thermometers can be safely used. Alcohol thermometers, from their tendency to separate in use, are unsafe for use in an incubator, and they are never so accurate as mercury thermometers. Mercury can not be colored, and the small column mercury thermometer has as yet had no safe substitute.

Electric thermometers, or incubator regulators have been used in France and Germany to some extent, and some incubator makers are now using them partly, and are hopeful of good results from them.

When two thermometers in different places in an incubator do not agree it is no evidence that thermometers are not accurate, but rather that there is not a uniform diffusion of heat. To show whether thermometers agree in reading, try them in water, with bulbs at the same level in the water, and water stirred to make heat equal.

While artificial incubation has made a great advance in ten years, and has made the poultry product the leading farm product of America, there is yet much to be learned. The needs of the case are to be met in the spirit of the learner who is teachable, rather than by the dogmatism that assumes to know it all. The results of the experience and knowledge of to-day may be modified or wholly changed by the larger knowledge and wider experience of to-morrow.

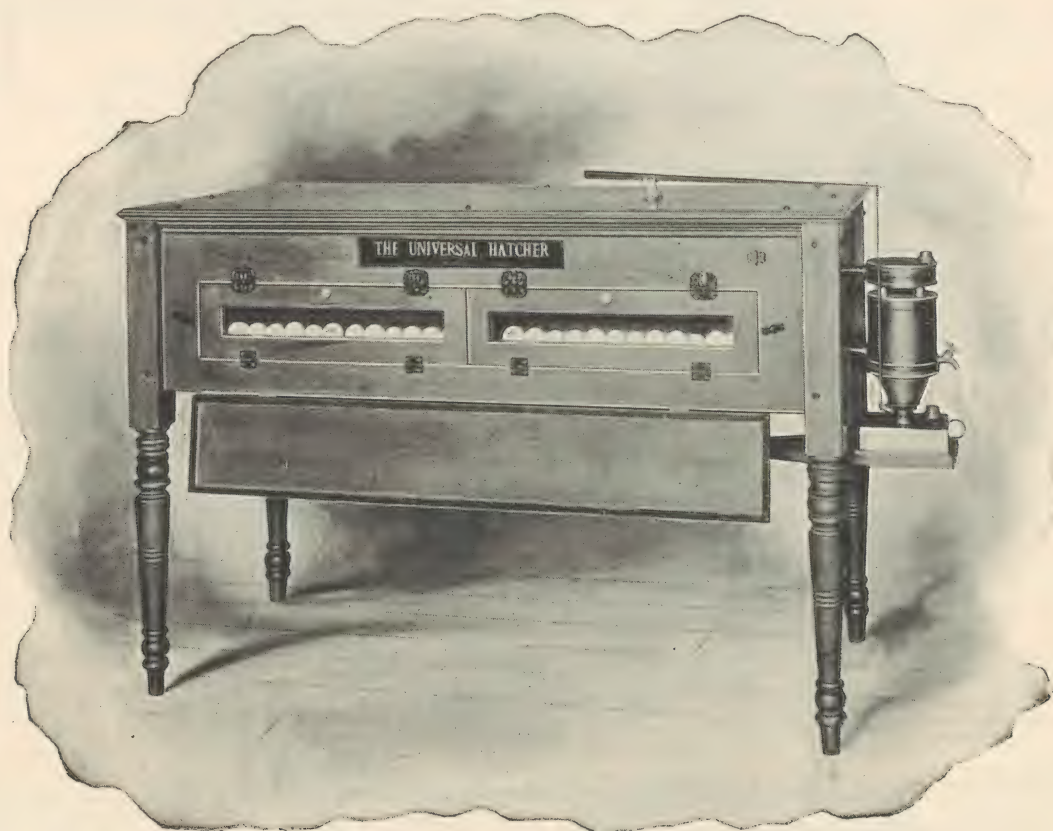
If this paper shall prove in any degree helpful to the success of artificial incubation, its purpose will be accomplished.

CHARLES WILDER.

THE UNIVERSAL HATCHER.

ONCE TRIED ALWAYS USED.

The Universal Hatcher was invented in 1883, and was first put in the show room in 1885. Every year since that time it has been exhibited and has always been awarded first prize. It stands at the head in the show room, never being defeated. The heaters and lamps are made of the very best copper and brass. The finish and entire construction of the Universal Hatcher has no equal. These machines are used in every state in the Union and in many foreign countries.



Wherever the Universal Hatcher has been exhibited it has been conceded by the most expert judges that it made a better exhibition than other incubators. An examination of this machine will convince the most skeptical, that it is the BEST. Send for our elegant catalogue and price list.

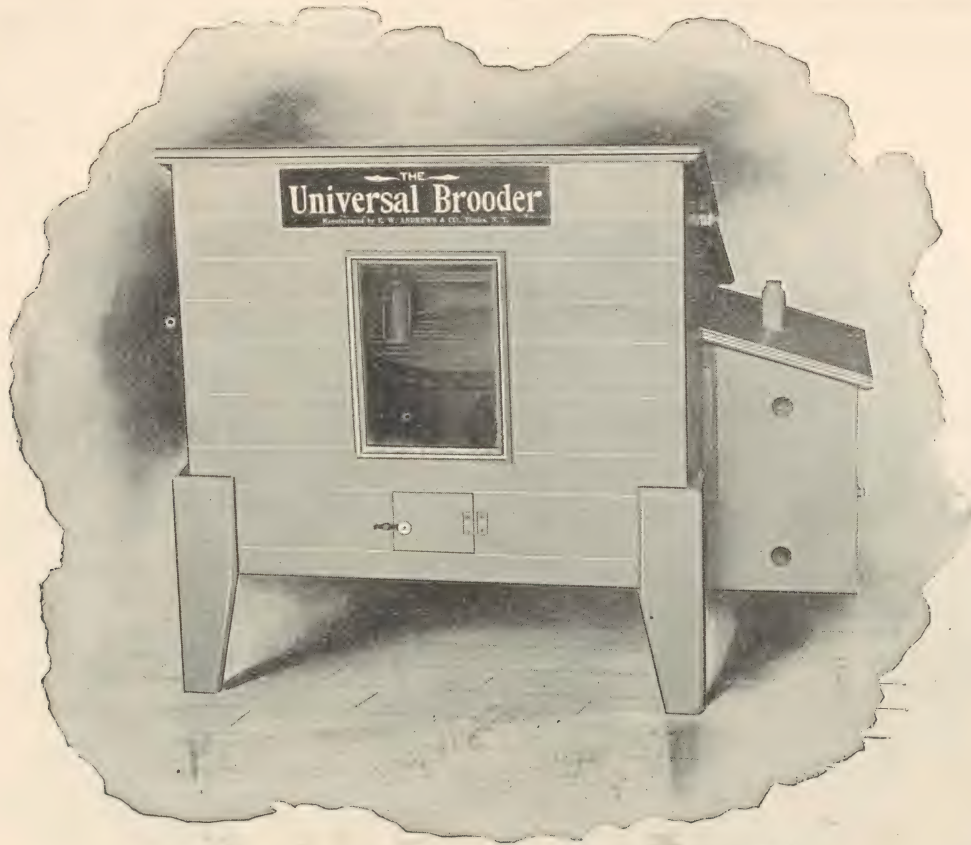
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THE UNIVERSAL BROODER.

Our brooders are made of the very best materials and can be used out of doors at almost any season of the year. The cry has been with breeders, "I can not raise my chickens in brooders." That has never yet been said of the Universal Brooders. It has the best heating system and no corners for the chicks to crowd into.



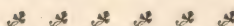
Our brooders are all top heat. No brooder that is cheaply made in order to sell at a very low price, can be made to work successfully. Considering the workmanship and material used in the construction of the "Universal," it is the lowest priced brooder on the market. Send for our catalogue.

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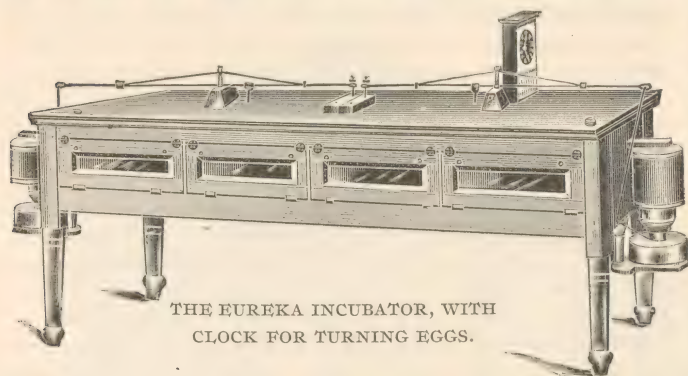
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I PROPOSE building an incubator to hatch at one time 100,000 eggs, and I offer my entire stock of second-hand incubators at prices which will defy competition. All these machines are practically as good as new. The prices given on the Eureka machines do not include clocks for turning the eggs, but I will put the clock on any machine at the



THE EUREKA INCUBATOR, WITH
CLOCK FOR TURNING EGGS.

regular price. All machines warranted to be in good condition. As all of them are machines which I have used for my own hatching, that will be a guarantee that they are good and have been well taken care of.

No. 1, 1000 eggs, steel tanks, hard wood, \$75. No. 2, 500 eggs, copper tanks, hard wood, \$45. No. 3, 500 eggs, hard wood (oak), steel tanks, \$40. No. 4, 600 eggs, white pine, imitation cherry, steel tanks, \$40. No. 5, 300 eggs, single tray steel tank, white pine, \$25. No. 6, 300 eggs, double tray, white pine, steel tank, \$25. No. 7, 72 eggs, steel tank, \$10. No. 8, 300 eggs, Aqua, double tray, \$20. No. 9, 300 eggs, iron tanks, double tray, exchange, \$15. No. 10, 200 eggs, iron tank, single tray, exchange, \$10. No. 11, 320 eggs, Perfect Hatcher (this machine was sold at one time largely at \$100 each), \$25. No. 18, 300 eggs, Palmetto, \$20.

The above list are all hot-water machines, warranted sound and good.

No. 12 will hold 200 to 300 eggs, hot-air, copper heater, \$20. No. 13, 220 eggs, hot-air, Palmetto, good as new, \$20. Nos. 14 and 15, 360 eggs each, hot-air Palmetto, good as new, can not be beat hatching, \$30 each. No. 16, 300 eggs, \$20. No. 17, 600 to 800 eggs, double machine, eight separate compartments, \$35. These are all hot-air machines warranted, good as new and splendid hatchers.

We have on hand the following list of new machines, which will be sold at given prices, without reserve. Prices quoted do not, in any case, include clocks for turning eggs but clocks can be placed on all Eureka machines at regular price of clock. The figures in this list refer in all cases to page of catalogue. If you are not acquainted with the machine, send for catalogue.

Page 54, six machines, 100 eggs, \$10 each. Page 57 six machines, 100 eggs, \$12 each; eight machines, 200 eggs, \$15 each. Page 58, two machines, 72 eggs, \$25 each; three machines, 144 eggs, 28 each. Page 59, twelve machines, all white oak, double tray, 300 eggs, \$35 each. Page 60, one machine, 300 eggs, walnut and ash, copper tank, \$50; two machines, 300 eggs, white oak, copper tanks, \$45. Page 63, one machine, 72 eggs, \$25; two machines, 200 eggs, \$40 each. Page 72 two machines, plain white pine, 500 eggs each, same list as page 68, \$40 each. This last list of machines are all hot-water. Copper tanks only where so stated, all the others galvanized. Three Old Hen machines, 300 eggs each, \$15 each. One new 360 eggs, hot-air, Palmetto, \$35.

I will accept a cash payment of 10 per cent on any of the above machines and hold same any reasonable length of time until wanted. Freight is not included in any case. Correspondence solicited about any of the above machines.

A NEW MACHINE.

I have placed on the market this season a new machine, called the Combination. This machine, without doubt, has never been equaled for hatching, and it is sold at prices that defy competition. It would be impossible to make and sell it below our prices. If it does not break us up we shall continue selling it for awhile, but would advise no delay if you wish to be sure to get a supply of them at the present prices. This machine is the culmination of a lifetime, almost, spent experimenting with incubators, and it will be the last one I shall ever bring out. The Combination is both hot-air and hot-water, and combines all the good points of both. Had I known enough twenty years ago to make this incubator I could easily have made a million dollars out of it in a few years. Write to me specially for prices and particulars. Special inducements to first customers. If interested do not delay writing, and mention this ad, sure.

Here are a few only of the nice things some of our customers say. Not one single solitary complaint has come in about the Combination, a remarkable thing for any incubator:

"I do not see how you can possibly build the Combination at the price you do. My first hatch was 163 chicks. It is the coming machine, sure."
T. M. VALEY,

NEW KENSINGTON, PA."

"My first hatch was 80, second, 90 per cent of the fertile eggs."
FRANK J. DUTCHER, HOPEDALE, MASS."

"I am hatching 90 per cent of the fertile eggs with the Combination. Send me another machine, for which I enclose the money."
B. E. GAZIN, SLIDELL, LOUISIANA."

"It is a much better machine than I expected to get. How you can build them at the price is more than I can tell. Will want a lot more no doubt."
H. S. CHESBROUGH,

CRAFTON, PA."

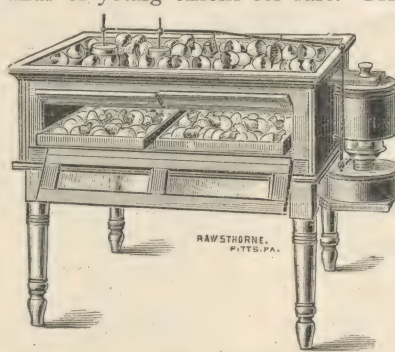
"GAMBRILLS, MARYLAND, Oct. 24, 1898.

ESTEEMED FRIEND: I used the Combination I purchased last spring, and am pleased to say that I hatched 150 chicks out of 180 tested eggs the first time, and 140 out of 170 tested eggs the second time. I expect to order three more machines next week.
ROBERT MATHEWS, M. D."

I could extend this list until it would tire you out. If you live near, go to see the machine and then go thou and do likewise. James Hamblin, of Ottawa, Kansas, has just bought seven machines, 300 eggs each. Go to see him. These are not the first machines we have sold him.

Every person who is using an incubator needs our hatching and testing chart. I have to use it myself. Postpaid, \$1 Cause, Cure and Prevention of Roup, 50 cents. Book and chart both at once, by mail, postpaid, \$1.25.

During April, May, June and July we hatch tens of thousands of young chicks for sale. Prices range from \$6 to \$20



THE PALMETTO INCUBATOR.

per 100 chicks, owing to the kind you want. We can ship them safely any distance. Express charges are very small as they go at single rates and weigh but a trifle. Do not waste your time and money buying infertile eggs, or eggs which will rot, but buy the ready hatched chicks. Mixed chicks, \$6 per 100. Pure bred Leghorns and Rocks, at \$10 per 100. Our very best of either at

\$15 per 100. Light Brahma chicks at \$15 per 100. We can hatch, on order, chicks of almost any breed, at prices not to exceed \$20 per 100. During the above four months we are hatching chicks all the time. To get them at any other season of year requires special correspondence.

The Origin of the Cyphers Incubator.

We herewith give an outside and inside view of the mammoth incubator erected on the poultry plant of Mr. Truslow, at Stroudsburg, Pa., three years ago. There have been many stories written regarding this mammoth invention, of its eventual success or failure, etc., but none quite true to life. In this connection it may be interesting to the reader to have a review of the work leading up to the Mammoth, and of the origin of the Cyphers Incubator.

The origin of the Cyphers Incubator dates back some five years, and the experimental work leading up to it six years farther back. In 1887 Mr. Charles A. Cyphers became interested in artificial incubation, and finding the art in a crudely



MR. CHAS. A. CYPHERS.

developed state, made a study of the subject, devoting nearly his entire time to it thereafter besides expending something like five thousand dollars in experimental apparatus. The history of the art was traced back for several thousand years and the Egyptian and Chinese methods studied, also the habits of the different species of mound birds, and others which do not incubate. All the English experiments from 1770 and the French from 1772 were carefully reviewed, as well as the American inventions, which began to come along about 1870. With this mass of information before him Mr. Cyphers began carefully testing the various theories which had been advanced from time to time, and by intelligent, experimental work, eliminated the wheat from the chaff, sought out the hidden secrets and drew aside the accidental phenomena which veiled them and with a master's hand began building up a perfect apparatus for artificially incubating eggs. In 1894 "Incubation and Its Natural Laws" was written and published, which received more favorable comment than any other work which has ever appeared in poultry literature. In fact it is the only complete treatise on the subject that has ever been published, and is to-day the only hand book of the art.

The Cyphers Incubator was not put on the market when completed, but a few sample machines were first distributed in different parts of the country, where they were tried by old incubator operators, and at the close of the season were pronounced far ahead of anything that had yet been manufactured. In the meantime Mr. Cyphers had contracted with Mr. William

H. Truslow, of Stroudsburg, Pa., for an experimental incubator to hold twenty or more thousand eggs. In November, 1895, work on this mammoth machine was begun, and occupied Mr. Cyphers' whole attention until the following summer. A building twenty-two feet square was erected, with an egg testing room (ten by twelve feet) attached, under which the heater was located. The main building was substantially and warmly built, with ten-inch packed walls. An inner central hatching room was designed, fifteen feet square, with the four walls, top and bottom covered with felt, so that there would be no air currents in contact with the eggs, and to secure a diffusive ventilation, as had been previously done with the small Cyphers machines. The next point was to heat this fifteen feet square room so that there would be no variation on any one level. This was accomplished, as had been first designed, by placing the heating pipes outside of the felt room, around the inner wall of the main building, making a separate circulating chamber, and securing diffusive heat as well as ventilation, which was also following natural laws and the design of Mr. Cyphers' previous invention, which had worked so well. So evenly was this room heated that the extreme variation on any one level was but a half degree.

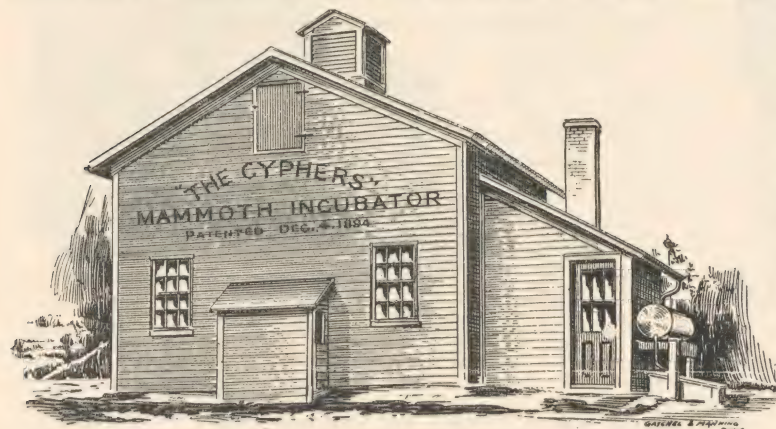
The next point was to control the heat, and this was the first and most difficult problem to solve. It had been found necessary to use a coal fire to heat the water in the large circulating system employed, to secure an even temperature in the hatching room, and the first apparatus put in was neither powerful nor sensitive enough to control a coal fire and this large circulating system. Various schemes were tried without success. Finally a spring motor was brought into play for power, actuated by a mammoth ten-foot multiple thermostat and an electro magnet. The regulating apparatus was finally adjusted in such a manner that the rise of a hundredth part of a degree in the hatching room would cause the draft of the fire to be turned off. Should the fire have



MR. FRANK G. PATCHIN.

burned up so as to keep on heating the water in the circulating system more than was necessary, a rise of another hundredth part of a degree in the circulating chamber where the heating pipes were located (between the felt walls of the inner room and the ten-inch outer walls), one of the fingers of the giant thermostat closed the circuit on another motor, which unlocked and raised a cover to a vent leading into the cupola, letting the surplus heat escape. When the supply and

natural loss of heat was balanced again, the vent was closed by a reverse action of the regulator. As the fire dies down under a closed damper the temperature in the hatching room falls a hundredth part of a degree, the thermostat, always sensitive and active, swings over a finger, closes the circuit, and the motor opens the draft of the heater and allows the fire to burn up a little. So sensitive is the thermostat that it can be set to close the circuit with a thousandth part of a degree variation, making a cycle every half minute, but it was found that a tenth of this was all that was necessary, which opens and closes the draft on the heater, and opens and closes the vent to the circulating chamber, making the complete cycle once every five minutes. So accurately was the system controlled that a variation of forty-five degrees in nine hours in



EXTERIOR VIEW OF THE CYPHERS MAMMOTH 20,000 EGG INCUBATOR.
STROUDSBURG, PA.

the outer temperature only caused a variation of one-half degree in the hatching chamber.

While the action of this regulating device is now very simple as well as accurate the working out of the details took the better part of five months and the expenditure of about one thousand dollars. The hatching chamber had an even heat on any one level, with a variation of about three degrees between the top and bottom tiers of eggs. This is the variation of the air temperature necessary to the first and last stages of hatching in a small incubator to take care of the animal heat, and in planning the mammoth it was thought that would be all which would be necessary in it; so that by placing the fresh eggs on the top shelf and as incubation progressed lowering them, the three degrees would take care of the animal heat generated. It was found, however, after putting in ten thousand eggs that the amount of animal heat generated was so great that three degrees would not take care of it. The trays were now spread out to a height of ten feet, but this only gave a variation of seven degrees between top and bottom, which was still not enough, and allowed the hatching eggs to overheat when the fresh eggs were at the correct temperature.

As the season was now so far advanced and both the time and money allotted to this experiment were about used up, several straight hatches were run through the machine to test the efficiency of the regulating and ventilating systems. Between two and three thousand eggs were employed at each test and the results ran as high as twenty per cent better than the hatches secured at the same time with the same run of eggs placed in the small machines run by Mr. Truslow at that time. Some high priced sittings of fancy hen eggs put in for another person hatched fifteen chicks from as many eggs, and another lot fourteen from fifteen eggs. This satisfied both Mr.

Cyphers and Mr. Truslow that the invention was worthy of further effort, but Mr. Cyphers' time was up and its completion was reserved for a later time. He went to Philadelphia to commence the manufacture of the Cyphers Incubators, 120, 220 and 360-egg sizes, which had proved so successful in the hands of others. The machine became well known the first season, owing to its remarkable hatching qualities. The business growing so rapidly, requiring a larger capital to carry it on, in December, 1897, Mr. Cyphers took into partnership with him Mr. Frank G. Patchin, of Wayland, N. Y., and considerable additional capital was put into the business. Mr. Patchin, besides being an experienced poultryman, is a young man of education and wide experience. He is a graduate of both Cornell University and the Albany Law School. After

leaving college he entered into newspaper work by beginning as a reporter on the *New York Press*, where he developed a keen faculty for working up criminal cases. After two years work on the *Press* he accepted an offer from the *New York Journal* to become its day editor. From that he rose, filling successively every editorial position of the paper. But the old fondness for criminal work led him to resign his editorial chair and take up this line on the staff again. He succeeded in running down many famous criminals, often where the police were utterly at sea. In 1895 Mr. Patchin withdrew from New York newspaper work and accepted a position as city editor of the *Washington Post* in order to gain a clear insight into the workings and problems of the national government. After remaining there for a year and a half he retired from newspaper work in order to attend closer to his real estate interests at Wayland, N. Y., and to devote more time

to the development of his poultry plant.

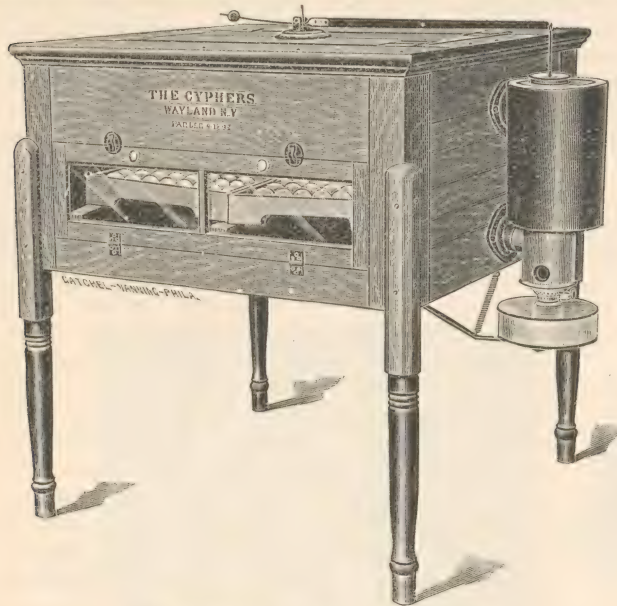
In May, 1898, the factory of the Cyphers Incubator Co., was removed to Wayland, N. Y. Wayland is centrally located on the lines of the Delaware, Lackawanna & Western; Erie; and Central New York and Western, giving unsurpassed shipping facilities on two of the fastest freight lines in America. Rochester is forty miles away; Buffalo ninety, and Elmira fifty.

The new plant is the largest and most perfectly equipped of any institution of its kind in the world. The entire plant, including the poultry division, covers an area of five acres, besides which there is an auxiliary poultry division on Mr.



INTERIOR VIEW OF THE CYPHERS MAMMOTH 20,000-EGG INCUBATOR,
STROUDSBURG, PA.

Patchin's five hundred acre farm south of the town, where the young breeding stock will be kept. The main factory building is three stories high and contains twenty thousand square feet of floor space. It is fitted with the most modern machinery and equipments, steam heated and lighted by electricity. A hundred horse boiler and sixty horse engine in an adjoining building furnish the motive power. There is a storage house of six thousand feet capacity, lumber houses, dry kiln, oil and



200 EGG SIZE CYPHERS INCUBATOR.

varnish house, experimental station, where all machines are thoroughly tested, and several other buildings of minor importance.

The lumber coming in on a private switch, is unloaded into one of the lumber houses, and from there begins to journey through the various departments. It is cut, planed and sized to fine measurements on the ground floor, from where big elevators take it to the floor above. Here the bench workers take hold, each man having his own special work, and by the time the incubators get around to the elevators again they are ready for the finishers. This part of the work is done on the third floor. After this they are sent to the regulating and testing department, and lastly to the packing room, from where they go either to the customer or into the storage warehouse. The brooders take the same course, excepting that they go to an

entirely different set of bench workers after they leave the machine floor. Only labor of the highest skill is employed, and from seventy to one hundred men are required in the shops alone.

Nearly fifty thousand dollars have been invested in this plant, made necessary by the unprecedented demand for the Cyphers Incubators and Brooders. On this plant will be erected a one hundred thousand-egg mammoth incubator. Ever since leaving the Stroudsburg machine Mr. Cyphers has continually kept the subject in mind and has made some experiments lately that clear up definitely the matter of making a complete success of it. Mr. Truslow's machine will be altered as soon as time permits after this machine at Wayland is in active operation, and two others erected, for which they have a standing order from two large breeders.

The question will naturally arise "What is the good of the Mammoth?" First, there is economy of operation. It is found that a ton of coal will run this Mammoth incubator seven weeks; that is, that three light shovelfuls of coal fed to the heater once every six hours, is all the fuel required. In the matter of time of operating, the economy is still more marked.

Mr. Truslow is an expert incubator operator and operated thirty incubators of another make, at one time. He says it took him about an hour and a half each morning, and the same each night, to turn the eggs and fully an hour and a half to trim the lamps, making four and one-half hours a day to care for incubators holding nine thousand eggs. In the Mammoth the actual time consumed in running the heater, testing the regulator, glancing at the thermometers, turning the eggs, etc., requires less than half an hour a day, leaving the operator free all the rest of the time for other work. The hatches run through this machine averaged from five to twenty per cent greater than those run at the same time in the machines which Mr. Truslow used before putting in the twenty-six Cyphers a year ago, which have averaged the past season fourteen per cent better than his best season before. Nevertheless he is anxious for the completion of the Mammoth on account of the economy in operating it. Mr. Truslow recognizes its great value and wants to be the first in line, as he did when contracting for the experimental machine to be placed on his farm. It is their intention to have one of these machines in the center of every thriving poultry district in the United States, where an expert operator can do the incubating for the community. To this end they intend to spare neither time nor money.

Upon request, the Cyphers Incubator Company, Wayland, N. Y., will send free, if you mention this book, a copy of their latest catalogue and guide to successful poultry raising.



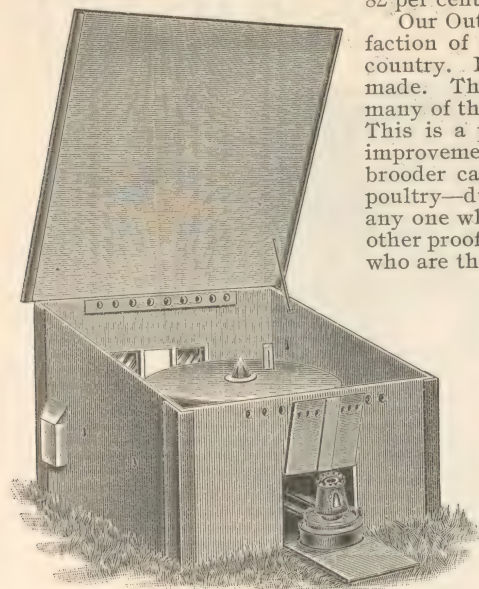
VIEW OF THE CYPHERS INCUBATOR FACTORY AT WAYLAND, N. Y.

FROM EGG TO EGG—PEEP-O'-DAY INCUBATORS AND BROODERS.

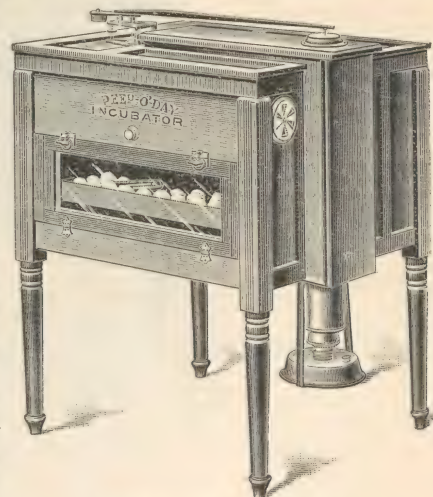
OUR incubator has stood the test beside the best makes, and it will hatch more and stronger chicks than any other machine. It is easily operated and the moisture is supplied in a very simple manner, so that it is impossible to make a mistake in this respect. Professor G. M. Gowell, of the Maine University, said: "Your incubator is very easily managed and we hatched 82 per cent of *all the eggs put in it.*"

Our Outdoor Brooder stands to-day without an equal. This has been proved to the satisfaction of everyone that has used it. We sell more brooders than any manufacturer in this country. It has more endorsements from well known poultry breeders than any brooder ever made. They are not only used in large numbers by the state experiment stations, but by many of the largest breeders in the United States. This is a perfect outdoor brooder and with our improvements for 1899 we know that no other brooder can equal it. It will brood any kind of poultry—ducks, chickens, geese, turkeys, etc., and any one who will read our catalogue will need no other proof. He will find endorsements from men who are the best authorities on poultry matters in this country. They not only endorse our brooders but use them in large numbers. Mr. Samuel Cushman, while at the Rhode Island Experiment Station, and after using our brooders a season, said: "If we were to raise 1,000 geese at the station next season we would use Peep-o'-Day Brooders." This station now uses a large number of our brooders.

Our Brass Brooder Stove is illustrated herewith. It is needless to say that a brooder should have a safe and durable lamp, or heater. We have experimented for years in this line and have produced a heater that will burn 36 to 48 hours, using but little oil (less



OUTDOOR BROODER.

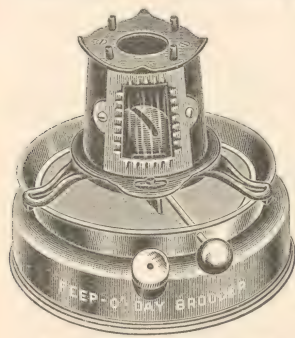


PEEP-O'-DAY INCUBATOR.

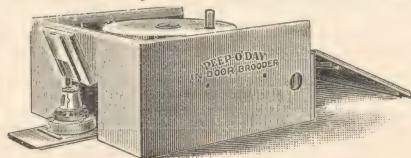
than any lamp its size), and it will last a lifetime. Safety is its strongest point. It will be appreciated by those using a cheap tin lamp, and who have had leaky, smoky lamps. We have sold thousands, and thousands stand ready to back us in our claims. Mr. Bruce Fenn, of New Haven, Conn., said: "We used twenty of your stoves in brooders out of doors, exposed to winter weather, and at no time was there any difficulty in keeping the proper temperature."

Mr. John W. Ayer, of Yantic, Conn., said: "Your stove kept my brooder at the required temperature *out of doors*, on the north side of a hill in winter, and it used very little oil. The brooder is large, having 16 feet of floor space, and this stove was the only article that could do the work."

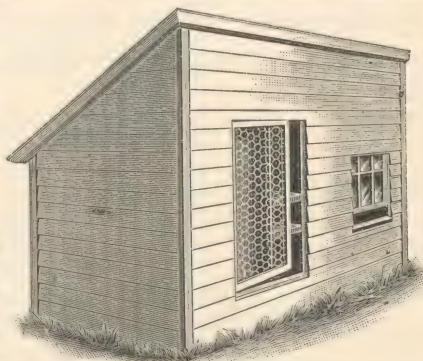
Our Indoor Brooder is used very extensively in long brooder houses, and many times hot-water pipe systems have been taken out and replaced by "Peep-o'-Days," because they will raise more and better chickens with less care. One or more brooders can be run as required. An even temperature can be kept at a desired degree in any brooder, and if the house is



BRASS BROODER STOVE.



INDOOR BROODER.



PORTABLE POULTRY HOUSE.

wanted in the fall for "grown up" stock the brooders are easily removed. Many farms use twenty to thirty brooders with entire satisfaction and they will never again use the pipe system.

Mr. W. W. Bottimore, of Galt, Cal., said, after ten years experience with different kinds of brooders: "I have used many kinds of brooders during the past ten years, but yours gave better satisfaction than any. I am using other makes, but will change them to the 'Peep-o'-Day' and have you send me the metallic parts." We sell the metallic parts and plans of our brooders, so you can build them yourself.

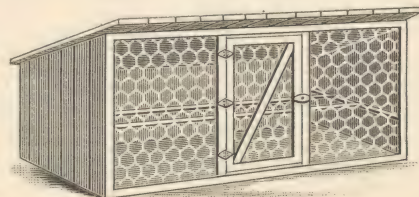
Mr. R. W. Baker, of Woonsocket, R. I., said: "I raised, with entire satisfaction, 2,000 chicks in the brooders I built of the parts I bought of you."

Our Brood Coop cares for your chickens when four to six weeks old. They fold up and are easily stored away when not in use. They are well ventilated, warm, and have more good qualities than any coop made. They will hold thirty chickens. After leaving this coop the chicks are transferred to our roosting coop.

Folding Roosting Coop is for older chicks. This coop is light and durable, is 6x3x3 feet, and will accommodate thirty good sized chickens. From this coop they are mated up and put into our houses for grown stock.



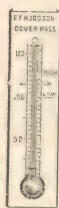
BROOD COOP.



FOLDING ROOSTING COOP.



Brooder Thermometer.



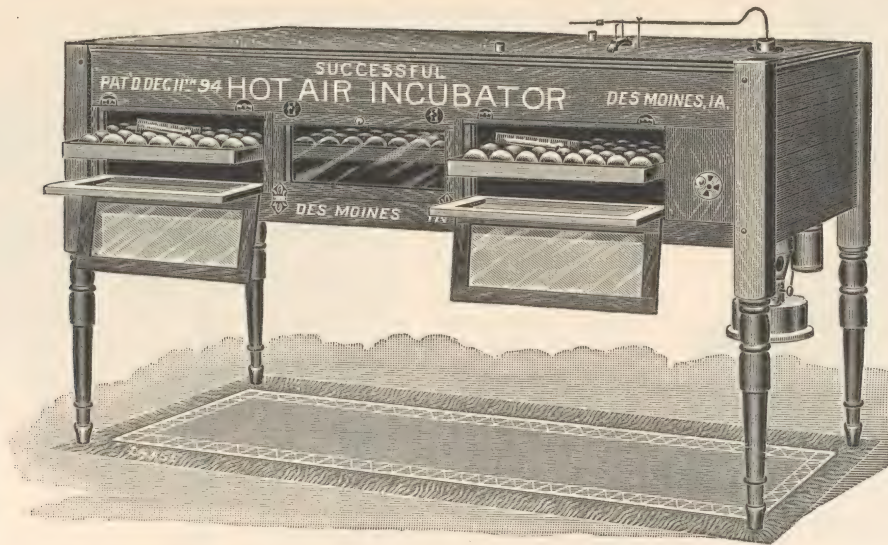
Incubator Thermometer.

Our special incubator thermometer is designed to hang up and can be plainly seen at all times. It is four inches long and guaranteed correct, being made by the best manufacturer in the United States. Price, 60 cents by mail. Our special brooder thermometer is tested and is a high grade thermometer. It has a casting to hold it in place in the hover, so the chicks can not knock it over. It is the only thermometer that is practical to use in a brooder, and no brooder is complete without it. Price, 40 cents each by mail.

X-Ray egg testers are convenient and can be used with the ordinary lamp. Price by mail, 25 cents.

Our Illustrated Catalogue for 1899, now ready, gives a full description and prices of our goods. Sent free if you mention where you saw this ad.

THE DES MOINES INCUBATOR COMPANY.



No. 8 New Style Successful Incubator.

The capacity of this incubator, with patent trays, is 312 eggs; with wire trays, 400 eggs. This machine is admirably adapted to the requirements of poultrymen who are engaged in the business on an extensive scale. Price \$33.

The regulator can be adjusted to operate at a fraction of a degree, with full confidence of its working perfectly.

All of our standard machines are made with nurseries under the trays. When the chicks are first hatched, they lie quiet for several hours until dry. After that period, 103 degrees of heat is too great for their health and comfort. This nursery supplies the want. The little fellows find the exit without assistance, and opening the machine during the critical period of hatching is wholly unnecessary.

Our egg tray adjuster is a marvel of perfection. The heating arrangement of an incubator, having two or more trays, may be ever so perfect and yet the thermometer will often show two degrees difference at certain periods of the hatch, even though no apparent variation takes place during the first week. This difficulty is most noticeable from the twelfth to the nineteenth day, caused by life's action within the eggs, and the heat is greatest on the tray containing the largest number of developing chicks. With our tray adjuster, the slightest variation in temperature on either tray is easily and perfectly controlled without opening the incubator doors.

All of our lamps for incubators and brooders are of the very highest order, sun hinges, burners with water safety attachment, making them doubly secure against a possible chance of accident.

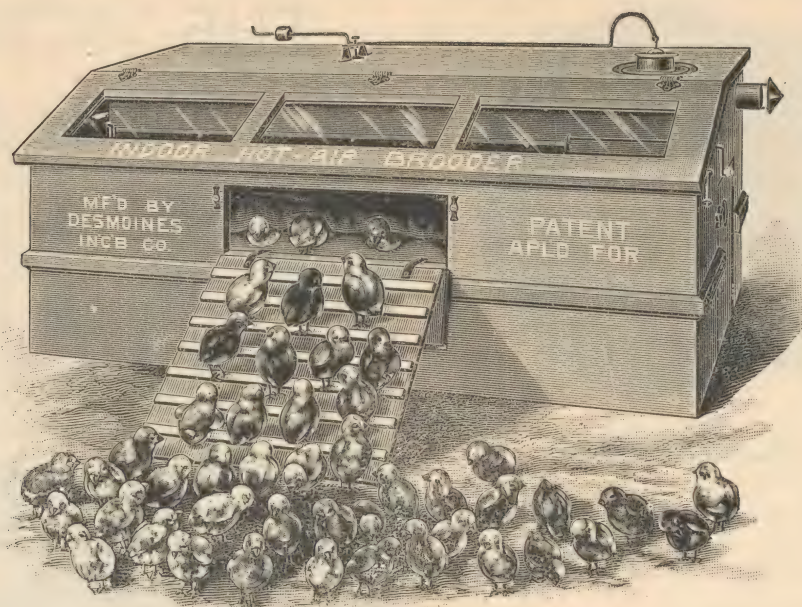
Our incubators range in size from 54-egg capacity to 800, and we sell them for \$8.50 to \$68. We challenge the world on quality and prices.

FOR FURTHER INFORMATION, ADDRESS

DES MOINES INCUBATOR CO.,

P. O. Box 8, Des Moines, Iowa.

THE DES MOINES INCUBATOR COMPANY.



Successful in Fact as Well as Name.

This illustration represents one of our favorite foster mothers, and we doubt if there is another apparatus of the kind giving as great satisfaction. Price \$10.

Remember a good brooder is one of the most important factors connected with successful poultry culture. The cheap affair with an incorrect device for heating, is the kind to let alone. A poor brooder will completely destroy the product of the incubator, however good the latter may be. Our line in this branch is very complete, and consists of a number of different styles and sizes. We also have for sale copyrighted blue print drawings of a modern, up-to-date poultry and brood house. Price, \$1 each.

In the construction of all our brooders we have looked well to their sanitary arrangement, also convenience. The lamps are stationed inside, at the end. All heat produced by the lamp and its connection is used within the brooder. None is wasted, as is the case where the lamp is placed on the outside.

The inside top is made with a sheet of galvanized iron placed above the heat-distributing pipes which extend over the entire surface of the brooding chamber. The one-inch space between metal sheet and the top board covering is packed firmly with mineral wool. This assists greatly in keeping the heat inside of the brooder, consequently reducing the fuel expense, and at the same time making the structure proof against fire.

All of our indoor and outdoor brooders are furnished with a trustworthy heat governor. It is the same system as that used on our incubators, and the lamps are of the same pattern as our incubator lamps. The curtain over the entrance to brooding chambers is raised or lowered by means of a little lever, without opening the doors.

FOR FURTHER PARTICULARS, ADDRESS

DES MOINES INCUBATOR CO.,

P. O. Box 8, Des Moines, Iowa.

Gold Medal...



THE VICTORS WON FIRST

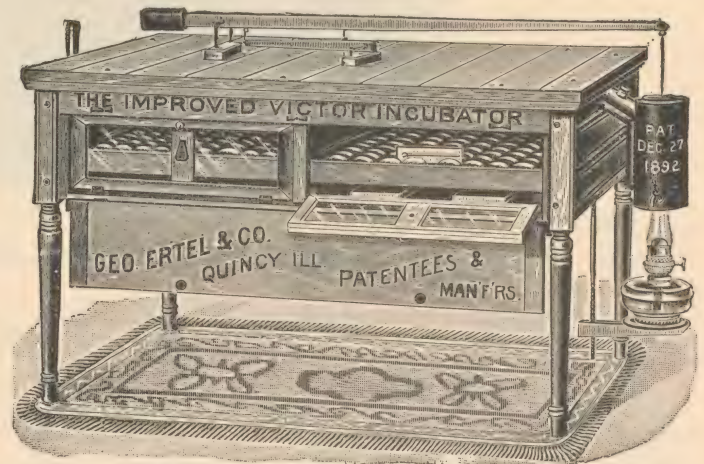
At the Great Trans-Mississippi and International Exposition, Omaha, June 1-Oct. 31, 1898. The most competent judges that ever gave a verdict on incubators and brooders awarded the first premium gold medal to the Victors.

The Mechanical Construction

and superior hatching qualities of these machines are readily recognized.

Positively the Cheapest

first-class up-to-date machines on the market. We guarantee them or bind ourselves to refund your money if they are not as represented, after they have been tried.



ABSOLUTELY SELF REGULATING.

Strongly Recommended by a Man whose Opinion is Courtied
and Followed.



MORRISONVILLE, ILL., U. S. A., May 7, 1898.

Geo. Ertel Company, Quincy, Ill.

GENTLEMEN: Early in 1897 I purchased of you one Victor Incubator and one Brooder. I have kept the incubator in a small building made of common inch boards, with chinks battened on the inside with lath and newspapers, and the machine has run as steadily as a clock and done first-class work, though the temperature outside has varied 58 degrees in 24 hours.

The brooder is kept in a building 7 feet wide by twenty feet long, made of inch boards with chinks battened with lath, and it has successfully raised hundreds of chicks while the temperature outside has varied from 10 degrees below zero to 90 above. No matter how cold it is outside a very small flame of the lamp keeps the little biddies in the brooder perfectly comfortable and growing.

The thorough and severe tests I have given your machines have satisfied me that they are as good in every respect as others costing three to four times as much—in fact, fully as good as anybody need want.

Yours truly,

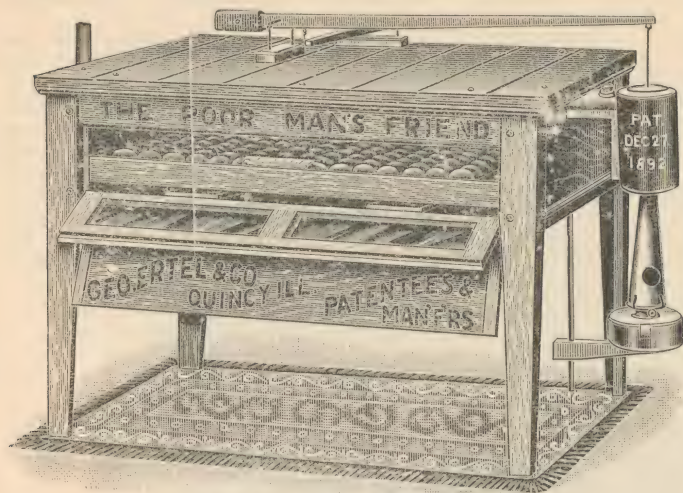
FRED GRUNDY.

Send 6 cents for 164-page handsomely Illustrated and Descriptive Catalogue, with a complete treatise about the business, poultry, poultry houses, etc., to

GEO. ERTEL COMPANY, Patentees and Manufacturers.
QUINCY, ILL., U. S. A.

THE VICTOR INCUBATORS AND BROODERS

Honestly won—not bought—the only First Premium Gold Medal and Diploma on Incubators and Brooders of any kind or any style, awarded over all competition at the Trans-Mississippi and International Exposition, Omaha, 1898, as the unanimous opinion of the Awarding Board of Jurors. Aware of the claims made by others, due probably to the power of money, we challenge the world to disprove our claim.



150-Egg Capacity.

Absolutely self-regulating. Every machine guaranteed. This guarantee accompanying the acknowledgment of every order for our Victor machines, binds us to refund the money if they do not prove as represented after they have been tried.



THE WAY THEY TALK ABOUT THEM.

422 CHICKS FROM 480 EGGS.

COBURN, PA., December 6, 1897.

Geo. Ertel Co., Quincy, Ill.

DEAR SIR:—My experience is that I am very much pleased with the Poor Man's Friend Hatcher and Brooder which I purchased about a year ago. I made four hatches and out of 480 fertile eggs hatched 422 healthy chicks. This will be considered very good by some that are running hatchers. There are several other machines here that I saw while running which turned out to be perfect failures, and the parties told me that they ran them exactly as directed. I can cheerfully recommend your hatcher and brooder; they work like a charm. Will just say that the regulator is one of the finest working things I ever saw; will hold the heat not to vary one-half degree during the hatch. Any one that wishes to write me about your incubator will promptly be answered.

Yours very truly,

J. W. KERSTETER,

P. O. Box 27.



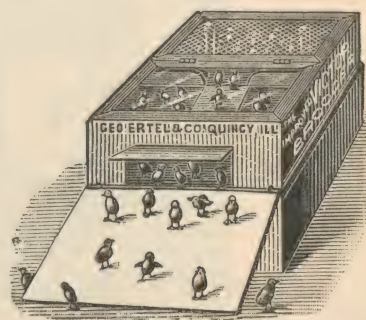
We also make the Hatching Wonder, 35-egg capacity, and the Brooder of 35-chick capacity. They are also built on the same principles as the Victors, and fully guaranteed.

All described and well illustrated in our new 164-page catalogue for 1899 (sent for 6c in postage). It will prove valuable, even if you do not purchase.

ADDRESS,

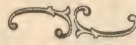
GEO. ERTEL CO.,

Patentees and Manufacturers, Quincy, Ill., U. S. A.



150-Chick Capacity.

THE MASCOTTE INCUBATOR.



THE Mascotte Incubator has only been offered for sale for two seasons, but has been in use for eight years by the inventors and their friends, in and around the city of Cleveland, Ohio. Never in the history of incubators has one been so favorably received by the public, or been so universally satisfactory. Never has an incubator made such rapid strides to the front as the Mascotte, until at the present time it ranks with the best in style, finish, durability, operation, results and everything that goes to make up a perfect incubator.

The outside, or case, of the Mascotte Incubator is made of a combination of selected hard woods, ash, oak, cherry, black walnut, butternut and white wood, so arranged that when finished the natural wood gives a very artistic effect. Our machines are so nicely finished that some of our city friends set them on a rug in their parlors while hatching, as a novel way of entertaining their friends.

The legs or table on which the machine stands are entirely separate, so that, if desired, the incubator can be taken apart

grocery or hardware store, so that if one fails during the hatch the hatch is not ruined waiting for one to be forwarded from the factory. The lamp sits outside of the incubator, on a swing shelf, and is entirely independent of the egg-chamber, so that should any fumes arise from the lamp they can not enter it (nothing is more dangerous to a hatch). The lamp is not in any way attached to the regulator.

The egg-trays are made of a wooden frame, with galvanized (quarter-inch mesh) woven wire bottom, which serves the double purpose of giving a free circulation of air through the egg-chamber and giving the little chicks something to catch their feet to, to liberate themselves from the shells. This tray sits back from inner door far enough to let the chicks, which are attracted to the front of the tray by the light that enters through the glass doors, drop over into the chick tray, which is underneath, and thus the little fellows are made more comfortable, as they are away from the excessive heat of the tank above. If for any reason the hatch drags, the chicks in



and put away after the hatching season. The Mascotte is made with two front doors. The outside door is hinged at the bottom to drop down when opened, and is glazed with what is known to the trade as iridescent glass (very ornamental); the inner door is hinged at the top, and is held open with an ingeniously devised spring. This door is glazed with heavy plate glass three-eighths of an inch thick, which will not break. By opening the front door, which can be done at any time during the hatch with perfect safety, one has a complete view of the entire egg-chamber, and every egg in it, through the plate glass. The object in making this door lift up is fully explained in our catalogue.

The Mascotte is a hot-water incubator, heater and tank being made of copper and constructed without pipes or flues (which almost invariably choke up with soot and smoke and cause trouble), and we guarantee that when the incubator is set up as directed every point of the egg-chamber will be of the same temperature. The lamp is non-explosive and made of metal, with a metal chimney. The burner is a common No. 3 Sun hinge burner, which can be purchased at any

this tray can be taken out without injury to the balance of the hatch. The turning of the eggs is accomplished by a simple device, which can be done perfectly in one minute.

The regulator of the Mascotte is entirely original, and the only regulator that is positive. On top of the incubator is placed a valve which closes an opening into the egg-chamber. Attached to this valve are two magnets; connected with these magnets is an electric thermometer in the egg-chamber, and an electric battery (dry). When the thermometer registers 104 the valve opens, and when the temperature drops to 102 the valve closes. Thus the machine is both regulated and the egg-chamber ventilated at the same time.

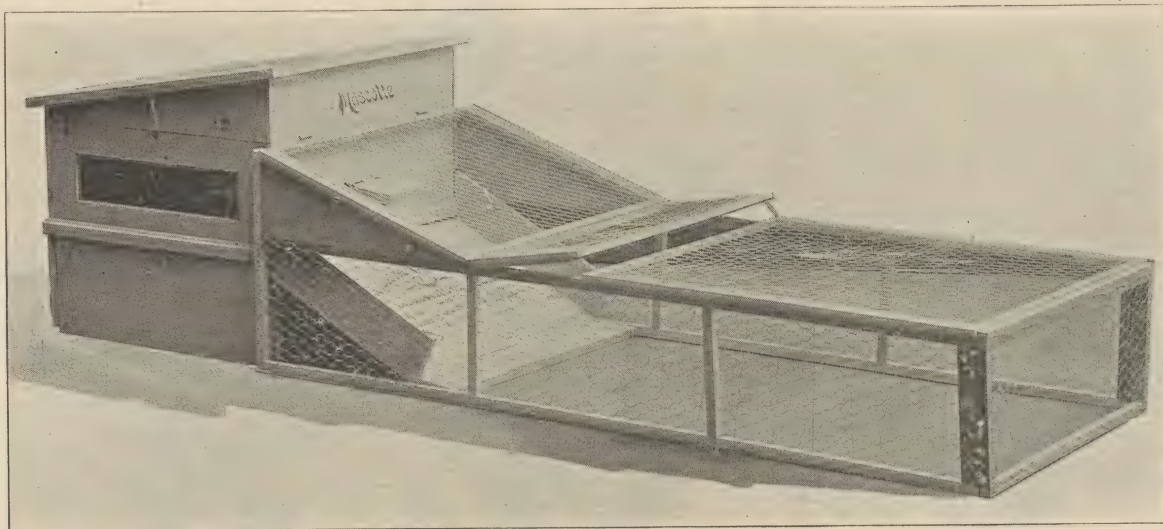
The Mascotte Incubators are made in two styles and five sizes. Nos. 2 and 3, Mascotte, Sr., have all the latest improvements. Nos. 100, 200 and 300, Mascotte, Jr., are not self-regulating machines, but excellent hatchers, and far superior to any other make, price considered.

Write to The Mascotte Incubator and Lumber Co., Bedford, Ohio, for their catalogue and price list, which will be mailed free if you mention where you saw this advertisement.

THE MASCOTTE BROODER.

THE Mascotte incubator has been a success far beyond the expectations of every one connected with its manufacture; and the Mascotte brooder has far outstripped everything known in the shape of a brooder that takes care of little chicks after they are hatched. We have received many letters from operators of incubators, saying that they could hatch a large percentage of fertile eggs, but could not raise them. In the past two years we have shipped out hundreds of the Mascotte Brooders, and have yet to hear the first com-

The lamp is non-explosive and is so placed in the lamp box that the fumes can not get into the chick chamber. Two sides of the chick room are of heavy glass, making it as light as outdoors, and every chick can be seen at any time. The illustrations show how easily it can be cleaned and operated and no explanations are needed. Only one size is made. It holds 100 chicks the first week or ten days, after which time they should be separated into smaller groups as they grow. The wire runs are manufactured in six-foot lengths and are so



A MASCOTTE BROODER READY FOR THE CHICKS.

plaint. They are perfect mothers, being so constructed that the heat radiates from the top and is distributed evenly throughout the whole chamber, so that the chicks settle down in all parts, and thrive accordingly. There are no rags, curtains, or other vermin or disease breeding paraphernalia used in their construction. Everything is movable and can be taken out and cleaned in a few minutes, as shown in illustration.

constructed that they can be connected by a system of grooves and extended to any length. Each brooder is well made of good lumber and painted with two good coats of paint. For further description of the Mascotte brooder write to The Mascotte Incubator and Lumber Co., Bedford, Ohio, who will send you one of their latest catalogues and price list free, if you mention where you saw this advertisement.



ADVANTAGES OF USING GASOLINE FOR INCUBATORS.

During the past year we have been experimenting with gasoline as a fluid with which to heat incubators. We have made a number of burners and at last have one that does the work perfectly.

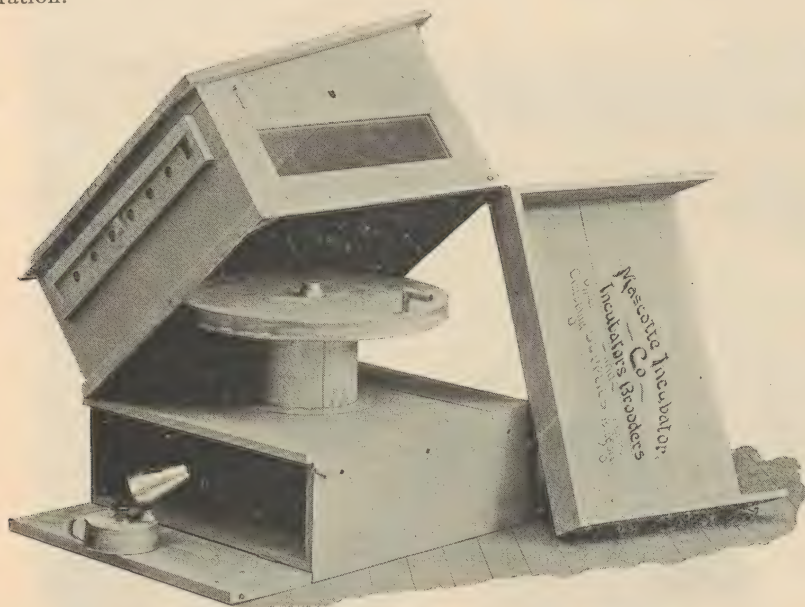
There are several advantages in using gasoline instead of coal oil:

First—The cleanliness.

Second—When the burner is once regulated it never needs changing and the temperature is more regular; while with the lamp, after trimming the blaze will run up, and after it has burned a while the wick will crust over and the temperature falls again.

Third—It needs no attention except once in three days, then the tank is filled and it runs for another three days.

Fourth—It is cheaper. We find that the expense of running a hatch with gasoline is about two-thirds that of coal oil, and the saving in time of filling and trimming lamps is no small item. These attachments we put on to any of our incubators when ordered.

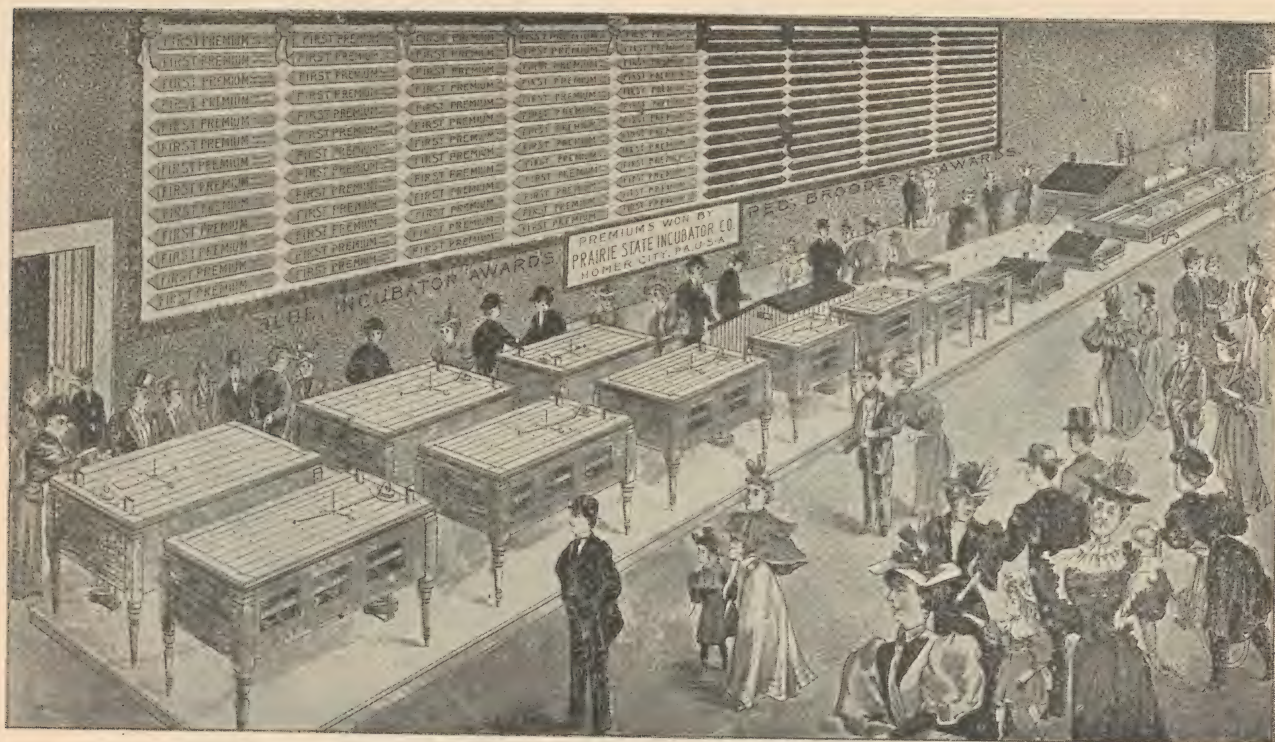


SHOWING THE INTERIOR OF A MASCOTTE BROODER.

ADDRESS

THE MASCOTTE INCUBATOR AND LUMBER CO.,
BEDFORD, OHIO.

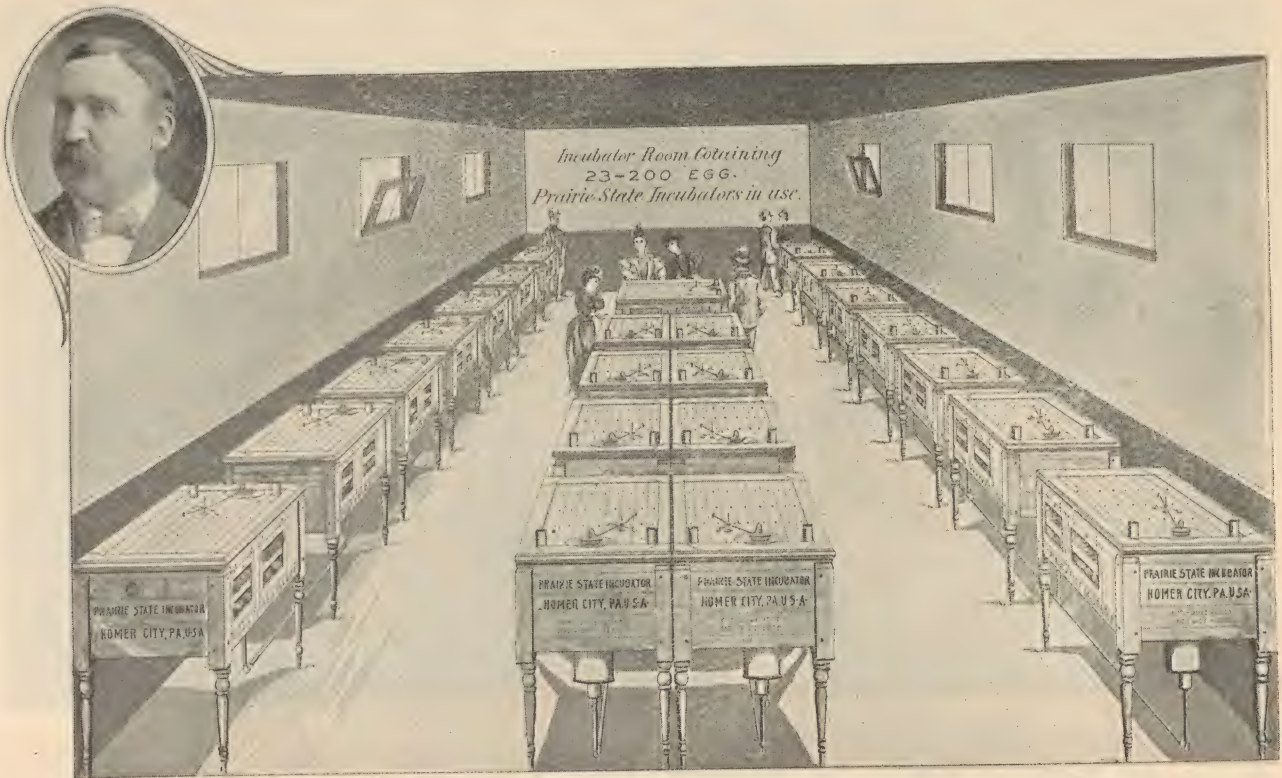
PRAIRIE STATE INCUBATOR COMPANY.



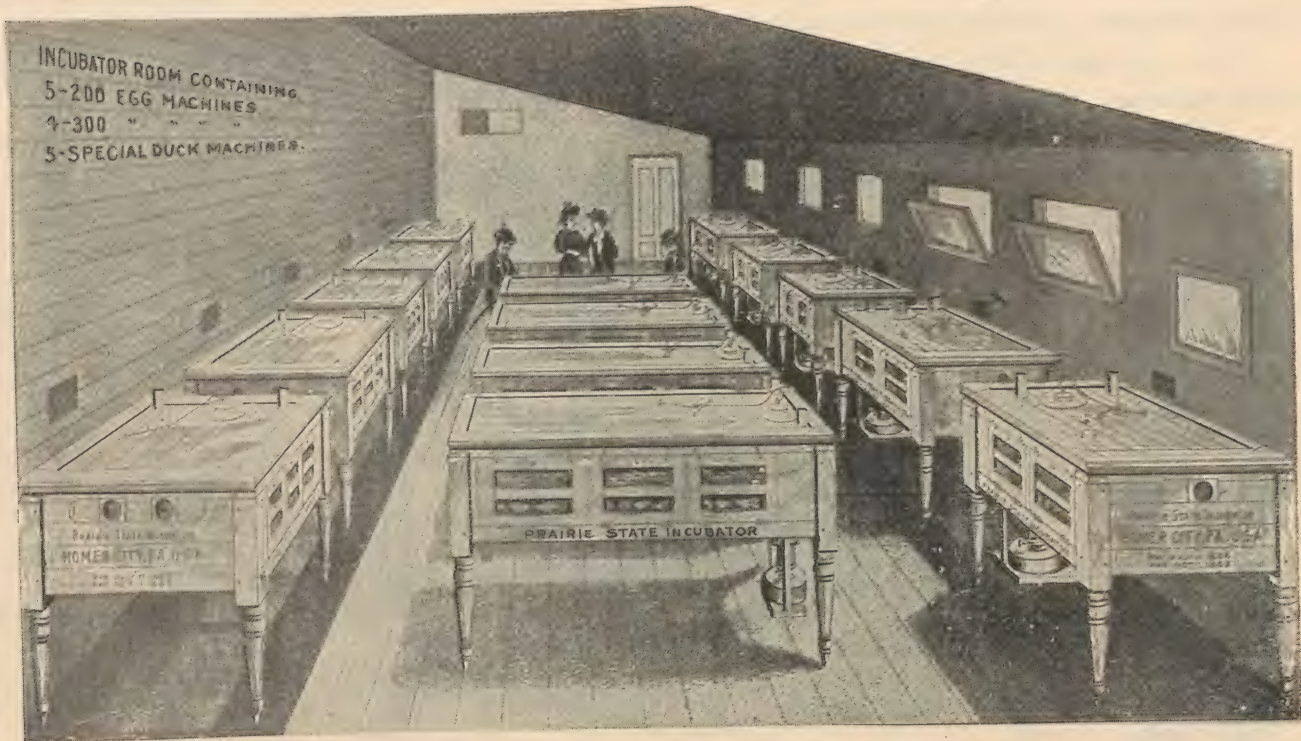
Prairie State Incubator Company's Mammoth Display, Boston, Mass., Jan. 1897-1898: hatching over 3,000 chicks while on exhibition.



Incubator Room of Wm. C. Casey, Katonah, N. Y., where 26 Prairie State Machines are in use.



Incubator Room of C. I. Nesmith, Reading, Mass., containing 23 200-egg size Incubators.



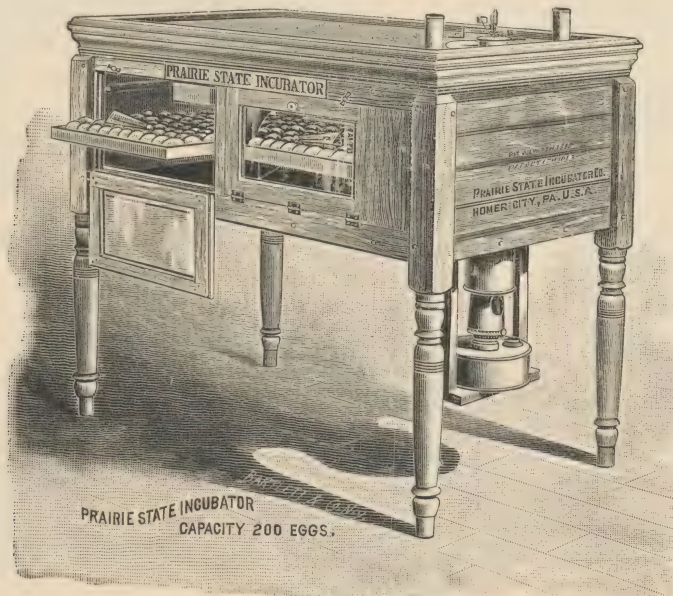
Incubator Room of Ernest Gerstenberg, Washington, D. C., containing 14 Prairie State Machines, of which five are 200-egg capacity, four are 300-egg capacity and five are special duck machines.



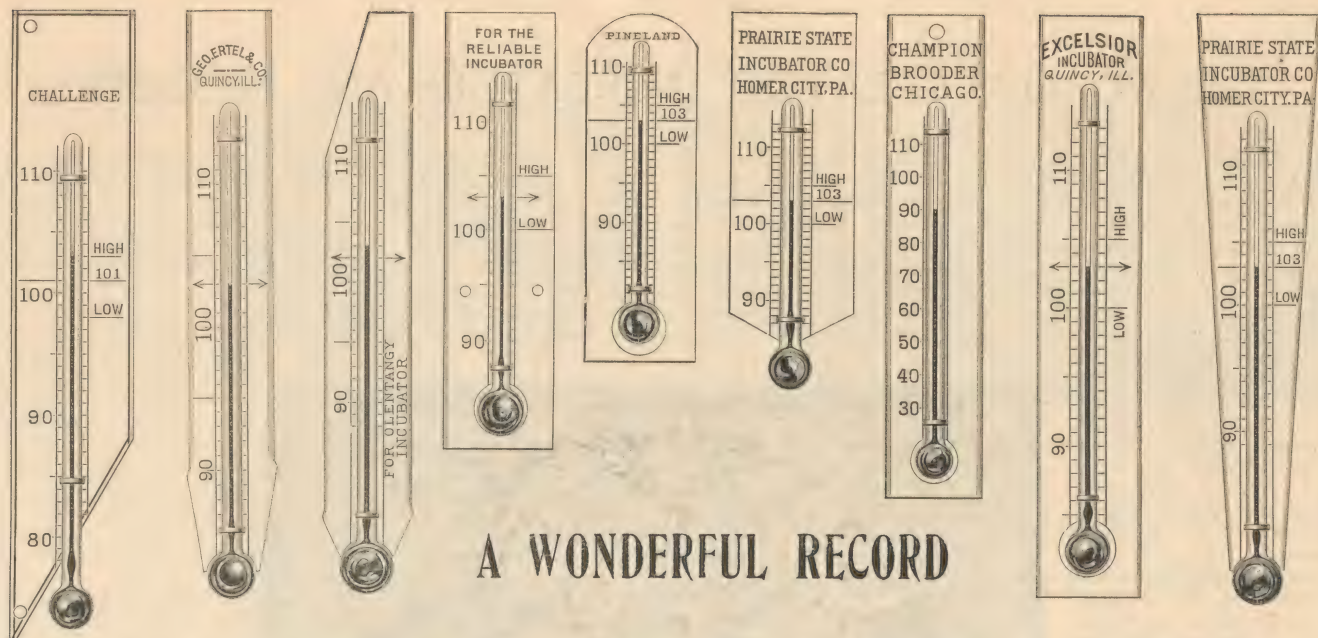
Prairie State Display at the Great Mid-Continental Poultry Show, Kansas City, Mo., January, 1897, winning 1st, 2d and 3d premiums on Incubators, and 1st, 2d and 3d premiums on Brooders.

The PRAIRIE STATE INCUBATORS are used exclusively on the U. S. Agricultural Experimental Farm, at Washington, D. C., also on the largest poultry and duck farms in the world. They have been awarded 263 first premiums, never having suffered defeat.

If you are interested in incubators and brooders, address us for catalogue describing class A and class B machines. All machines warranted.



PRAIRIE STATE INCUBATOR COMPANY,
HOMER CITY, PA.



A WONDERFUL RECORD

We have sold nearly 200,000 Thermometers to the Incubator Trade in six years, and it has not been proven that there has been a poor Thermometer in them all. Among our customers are

THE PRAIRIE STATE INCUBATOR CO., Homer City, Pa.

RELIABLE INCUBATOR AND BROODER CO., Quincy, Ill.

GEORGE ERTEL CO., Quincy, Ill.

PEERLESS INCUBATOR CO., Quincy, Ill.

DES MOINES INCUBATOR CO., Des Moines, Iowa.

SHOEMAKER INCUBATOR, CO., Freeport, Ill.

J. H. JONES, Streator, Ill.

FAMOUS MANUFACTURING CO., Chicago, Ill.

PINELAND INCUBATOR AND BROODER CO., Jamesburg, N. J.

BLAIRSVILLE MANUFACTURING CO., Blairsville, Pa.

GEORGE S. SINGER, Cardington, Ohio.

WOOD & PAIGE, Lynn, Mass.

JAMES RANKIN, South Easton, Mass.

MASCOTTE INCUBATOR AND LUMBER CO., Bedford, Ohio.

E. W. ANDREWS & Co., Elmira, N. Y.

STAR INCUBATOR CO., Bound Brook, N. J.

MONITOR INCUBATOR CO., Moodus, Conn.

GEORGE J. NISSLY, Saline, Mich.

E. F. HODGSON, Dover, Mass.

JOHN D. MERCER, Los Angeles, Cal.

And forty-one other manufacturers of incubators.

That the trade appreciates what we are doing for them is shown by the following:

HOMER CITY, Oct. 22, 1898.

MR. CHARLES WILDER, Peterboro, N. H.

Dear Sir:—In reference to your incubator thermometers, you have furnished us 198 gross, and to-day we place an order with you for 50 gross more. We have found after a careful test that your thermometers run very even and have given perfect satisfaction, not only to us but to our customers; hence the order we place in your hands to-day for 50 gross more.

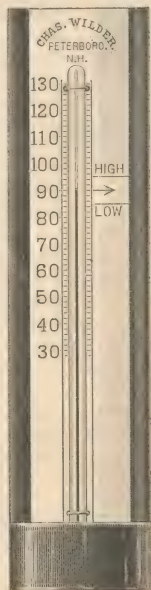
Very truly yours,
PRAIRIE STATE INCUBATOR CO.

We want all who use Incubator Thermometers to get **WILDER'S**. We advertise to keep in touch with the trade, and prefer that customers buying one or two thermometers should buy them where they buy their incubators. All incubator makers keep thermometers to supply mail orders, and as nearly all of them buy **WILDER'S**, you can be sure of getting good Incubator Thermometers of them. We also make a large variety of Thermometers for general use.

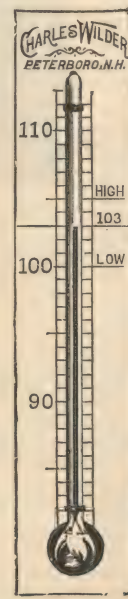
CHARLES WILDER,
PETERBORO, N. H., U. S. A.



7 inch
Bevel Flange,
\$1 each by
mail.



E. F. HODGSON,
Dover, Mass.



6 inch Regular,
75c each by mail.
Two, \$1.10.



7 inch Regular,
\$1 each by mail.

THE WORLD'S GREATEST INCUBATORS AND BROODERS.

WE feel free to claim that the Reliable Incubators and Brooders, judged strictly on their record and on their practical merits are the best incubators and brooders manufactured in this or any other country. During the past ten years the Reliable has gone fearlessly into the hottest of competition, picking out the world's greatest expositions, where these incubators have been exhibited in open competition against all comers. Whether or not the claim we here make for our incubators and brooders is true, is simply a question of record.

We shall not enumerate the large number of county, district and state fairs, also winter poultry shows where the Reliable has been placed on exhibition and has won first premium and highest awards, but call the reader's particular attention to the fact that the Reliable has come off victorious at the greatest expositions held in this and a number of foreign countries during the past several years.

We first call attention to the record made by the Reliable at the World's Columbian Exposition, where it hatched the largest number of chicks from 200 untested eggs of any one of the several machines on exhibition and won highest award and a special diploma of merit, an exact reproduction of which is printed herewith. Beneath this diploma we reproduce the exact words of the award made by the World's Columbian Commission, as they appear in small type on the face of the diploma. The Reliable was on exhibition during the six months of the World's Fair, and as a result we have sold hundreds of machines for shipment to foreign countries to people who saw them in operation at Chicago and were impressed with their superior merits.

Again, at the great Cotton States and International Exposition, held at Atlanta, Ga., September 18 to December 31, 1895, the old Reliable won first premium in competition. Regarding this exposition as the "World's Fair of the New South," this company went there at great expense, placed their machines on exhibition during three and one-half months, or from the opening day to the close of the exposition, where they were seen in practical operation by tens of thousands of visitors. As above stated, first premium was here awarded to the Reliable. For an exact reproduction in colors of the blue ribbon, see our catalogue.

The Reliable has been exhibited in competition in several foreign countries, and we have already engaged space at the great Paris Exposition to be held in 1900 at Paris, France. At the great International Exposition, held at Brussels, the capital city of Belgium, from June 1 to September 30, 1897, the

Reliable was awarded first premium and highest honors over fifteen competitors, (see fac-simile of diploma printed herewith). Also at the National Exhibition held at Stavanger, Norway, July 5 to August 10, 1897, first premium and highest awards were placed on the Reliable, in competition. In all these cases the Reliable was in constant operation, hatching chicks in large numbers for the instruction of spectators and to demonstrate the easy working and practical value of these machines.

Last, but by no means least, the old Reliable hot-water

incubators were awarded First Premium and Diploma for Gold Medal at the Trans-Mississippi and International Exposition held at Omaha, Neb., from June 1 to October 31, 1898. At this great exposition four awards were offered as follows: First, diploma for gold medal; second, diploma for silver medal; third, diploma for bronze medal; fourth, diploma for honorable mention. We present herewith a fac-simile (reduced in size) of the official diploma for gold medal awarded the Reliable Incubator and Brooder Co., on its hot-water incubators, or "highest awards," (see reading on face of medal) as awarded to this company on its favorite, stand-by, hot-water style of incubator by the international jury of experts. The competition at this exposition was very keen. The Reliable Incubators were in operation during the entire five months, hatching large numbers of chicks, and in addition to the First Premium and Highest Awards, consisting of the diploma for gold medal awarded to us on our hot-water style of incubators, we also won silver medal on our hot-air style of incubator and silver medal on our incubator and brooder combined, with diplomas. In the latter case there was no competition, hence the silver medal. Gold medals



INCUBATOR AND BROODER COMBINED: The machine is well constructed of good material. The hot-water system of heating is employed, and the unusually large capacity of the hot-water tank renders sudden changes of temperature impossible and is a meritorious feature. Ventilation and temperature are regulated by the operator, the large quantity of water used in the tank and the completeness of the air piping system rendering the regulation easy. The eggs are placed on a movable slide and quickly turned without removing them from the chamber. The absence of all perplexing apparatus insures ease of operation.

were not awarded unless there was competition.

It may thus be seen that the old Reliable has been put to the test at the world's greatest expositions where competition was open to everybody, and where in a majority of cases the best incubators manufactured were put to the test. The Reliable is always willing to be judged by its records, both on exhibition and in practical use in the hands of thousands of people who use it in the city, the village or on the farm.

With a view to impressing on the minds of the readers of this book the scientific construction of the hot-water Reliable Incubators and the durable materials used in making them, we present herewith illustrations of sectional views showing and explaining their interior construction.

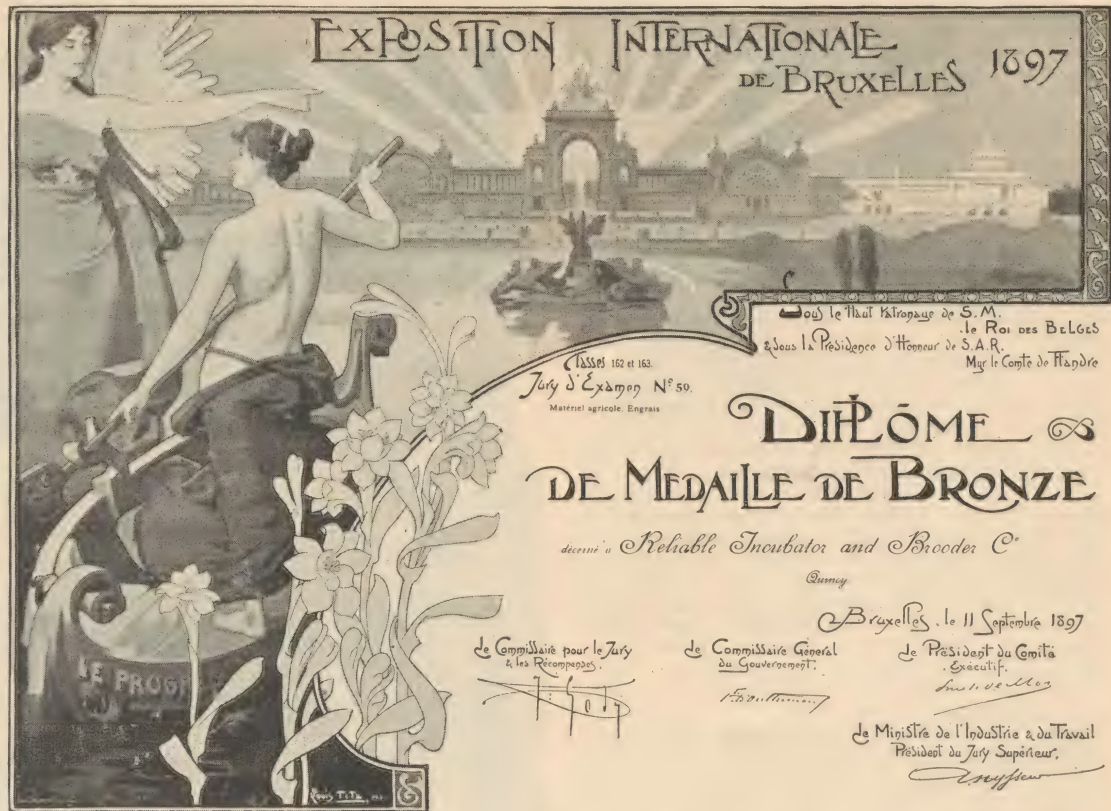
Quite often people write to us, stating that when we get the prices of our incubators down to \$10 or \$12 each, they will

invest in one. These well-meaning people are laboring under a mistaken idea. They no doubt think that an incubator consists of little more than a wooden box with a tin tank inside of it. An examination of the above illustration should correct this wrong idea. This sectional view of the Reliable Hot-Water No. 3 copper finished, self-regulating incubator shows where the money a purchaser pays for a first-class incubator goes to. After considering the several well-made parts of this New No. 3 Reliable, bear in mind that in order to secure a durable and lasting machine, one that will stand the test of years and continue to do the work satisfactorily season after season, nothing but first-class and costly materials can be used. The prices asked this year for our Improved Reliable Incubators are as low as we can afford to make them, consistent with first-class goods, which we guarantee them to be.

LATEST IMPROVED RELIABLE BROODERS.

We have not space at our command in these pages to fully illustrate and describe, as we desire to do, our latest improved indoor, outdoor and sectional brooders. We make a special request that every reader of this book who is interested in raising poultry by artificial means shall send for our catalogue

and investigate the principles embodied in our patented brooders. They are the truest to nature and give the best



FIRST PREMIUM DIPLOMA AWARDED RELIABLE INCUBATOR AT BRUSSELS, BELGIUM.

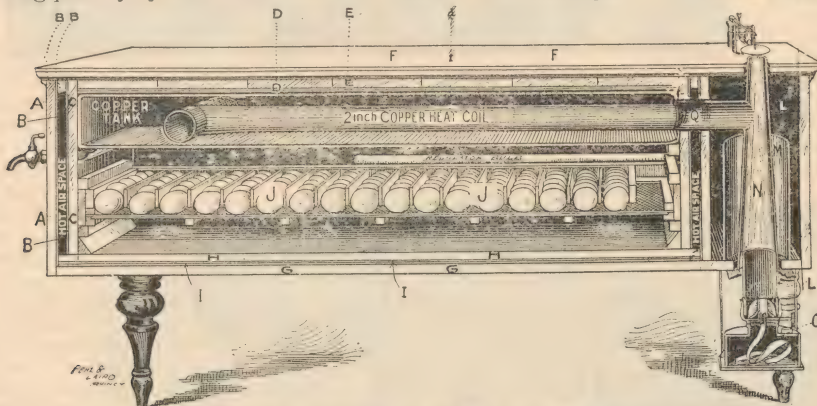
results of any brooders we have ever seen in operation. We manufacture them in all the popular sizes, and have both the hot-air and hot-water styles. Particular attention is called to our sectional brooders, which we consider a great boon to all persons using incubators and desiring to raise early chicks safely with a minimum of trouble and expense. See latest catalogue.

OUR DOUBLE LOOP HOT-WATER HEATING SYSTEM.

This company was the first one to introduce the double loop pipe hot-water heating system, illustrated on this page, with pipes extending in both directions from the heater. This plan is a great improvement on the one-arm system where the pipes extend the full length of a 100, or even 200-foot brooding house, the heater being located in one end. It will be readily understood that the better plan is to locate the heater midway of the house, extending the pipes in both directions, thus bringing the source of heat much nearer to the brooders and pens located near the ends of the building. These heaters are the most economical in use where large houses are to be heated, and those made by this firm are self-regulating. Where hard coal is used two tons will heat a large poultry house throughout the season, beginning in February and continuing through until no artificial heat is required. We furnish full plans for brooding houses and for heating same.

OUR INCUBATOR AND BROODER COMBINED.

We call especial attention to the illustration of our new No. 3 Reliable Incubator and Brooder combined in one machine and heated by one lamp. A combined machine should not be run in a cellar or other sunless apartment, but if the room in which the incubator is to



Sectional View (Lengthwise) of New No. 8 Hot-Water Incubator.

KEY TO ILLUSTRATION.

AA—Outer wall, selected 1 1/2-inch thoroughly seasoned cypress, guaranteed to be free from knots, lined with red resin card board.
BB—Hot-air space through which a current of surplus heat constantly circulates.
CC—Inner wall, seven-eighths of an inch thick, lined with red resin card board.
D—Double layer of red resin card board.
E—A layer of mineral wool, 1 1/2 inches thick.
F—Top thickness of machine, three-inch wide tongued and grooved lumber.
GG—Lower thickness of bottom, seven-eighths tongued and grooved lumber, lined on inside with red resin A card board.
HH—Upper thickness of bottom, seven-eighths tongued and grooved lumber, lined with red resin card board.
II—Three-quarters of an inch air space between double bottom and card boards.

JJ—Egg rack for turning eggs.
KK—Surplus heat or lamp chamber in which the lamp flue or heat receiver is located.
L—Metallic lamp chimney.
M—Galvanized iron jacket, surrounding the lamp flue or heat receiver.
N—Lamp flue or heat receiver.
O—Bowl of conper lamp.
P—Heat flue, directly above lamp flame where the heat passes out when the regulator damper is open, instead of passing into the heat coil.
Q—Heat flue, where the heat passes into heat coil, when the regulator damper is closed.
The tank, heat coil running through tank and regulator bulb may be seen in the illustration, each named in full. The regulator bulb is located in the back part of machine on a level with the top surface of the eggs.

be operated is well lighted, like a south, southeast or southwest room in a dwelling, a good poultry house or stable, then the combined machine is both practical and economical. With this machine there is a great saving of time, labor and expense in operating. The incubator and the chicks can be attended to at the same time. An essential point in poultry raising, especially early in the season, is to get the young birds well started on the road to health at the time they leave the shell. With our nursery attached to the hatcher, the little chicks, during the most delicate and tender period of their lives, are nicely sheltered and made comfortable.

By a new arrangement our Improved Combined Incubator and Brooder utilizes practically all of the heat that is generated by the lamp, wasting none. In this machine we have a practical and safe arrangement where top heat, and plenty of it, is secured for the chicks from the one lamp. In using this combined machine we recommend as follows: Place it in a well-lighted apartment. When the chicks hatch out you have here ready for use a convenient and comfortable nursery, which requires no extra expense to run, nor extra work in the way of filling lamps, etc. Place the chicks in the brooding apartment, leaving only one of the end doors leading into the yard open in the daytime when it is cold in the apartment, but opening both of these doors as it grows warmer. At night close both doors, but be sure to open the vents on top of the brooder and in the front. If it should promise to be an extremely cold night, close all ventilator holes in brooder but one, leaving this open for fresh air for the chicks. They can thus be made, even in the severest weather, as snug as bugs in a rug.

When the incubator is to be operated right along, hatch after hatch, a separate floor brooder, or a sectional brooder should be bought with the combined incubator and brooder. Then, when the chicks from the first hatch are about two weeks old, the larger and stronger of them should be placed in the separate brooder. The smaller and weaker ones (and there will always be some of these on account of the difference in the eggs and in the hens that laid the eggs, etc.) should be left in the top nursery and given a chance during the third week to catch up with the others. If at the end of the third week any of this lot are still weakly, leave them where they are, as the new comers will be able to hold their own with them; but all that have caught up in strength should now be placed with their brothers and sisters in the same brooder. Repeat this program with the second lot until the third hatch is within a week of being due, then shift the five-weeks-old chicks from the floor brooder into a second brooder or another apartment of the sectional brooder, or now put them into an outdoor brooder, which is really the place they should go for their greatest well-being.

LARGEST POULTRY SUPPLY HOUSE IN AMERICA.

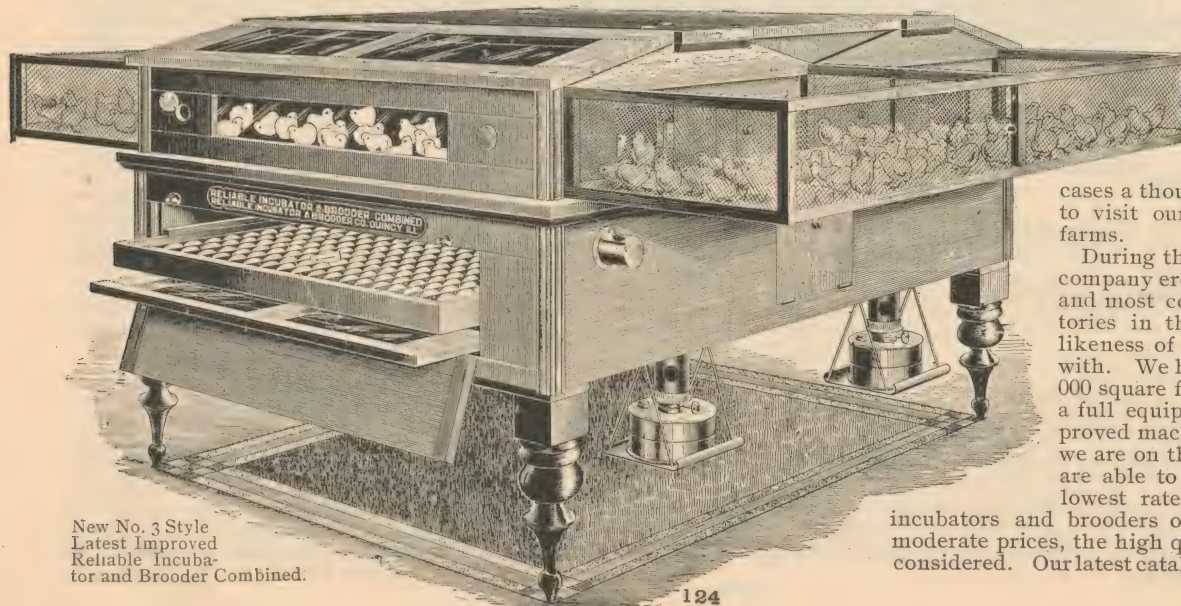
This company's establishment is not only the largest poultry supply house in America, but is believed by us to be the



AWARDED TO RELIABLE HOT-WATER INCUBATOR.

only one that carries a complete stock of all kinds of standard poultry supplies, also operating a poultry farm, and thus being in a position to furnish customers with a complete outfit for embarking in the poultry business on any scale, small or large, even to furnishing them with standard-bred poultry of the popular varieties, or eggs for hatching in hundred or thousand lots. Visitors have come many miles (in some cases a thousand miles and more) to visit our factory and poultry farms.

During the summer of 1898 this company erected one of the largest and most complete incubator factories in the country, a faithful likeness of which is shown herewith. We have in this factory 30,000 square feet of floor space, with a full equipment of the latest improved machinery, and, located as we are on the Mississippi river, we are able to buy our lumber at the lowest rates and thus place our brooders on the market at very low prices, the high quality of the materials being shown in our latest catalogue, consisting of 240



New No. 3 Style
Latest Improved
Reliable Incuba-
tor and Brooder Combined

RELIABLE INCUBATOR AND BROODER COMPANY.

pages, will be sent free to any one mentioning that they saw our business announcement in Artificial Incubating and Brooding. This catalogue fully illustrates and describes not only our incubators and brooders, but also the full and complete line of poultry supplies manufactured or handled by us. These supplies include the best green bone cutters, dry bone mills, poultry netting, drinking fountains, feed troughs, caponizing instruments, hygrometers, chicken markers, spray pumps, lice killers, poultry medicines, poultry foods, exhibition coops, food cookers, grit for poultry, crushed oyster shells, bone meal, granulated bone, ground beef scraps, roofing and building paper, blood meal, egg carriers and many other articles.

Our latest catalogue also illustrates and describes the standard breeds of poultry handled by us and offered for sale, including the following popular and most valuable varieties: Barred Plymouth Rocks, White Plymouth Rocks, White Wyandottes, Silver Laced Wyandottes, Light Brahmas, Single Comb Brown Leghorns, Imperial Pekin Ducks, Toulouse Geese and Bronze Turkeys. Persons wishing to place a complete order with one and the same firm for all the goods they need, including incubators, brooders, poultry and eggs, should get our catalogue and obtain from us an estimate on the goods wanted. We are prepared to furnish blue prints for brooder houses of different styles and for incubator cellar showing how to heat and operate same, giving lumber list and prices. We take special pains in our correspondence department to answer all questions asked by our patrons, or by prospective customers and thus do our best to serve their interests as well as our own. Awaiting your further commands,

We remain, yours respectfully,

RELIABLE INCUBATOR AND BROODER CO., Quincy, Ill.

TESTIMONIALS.

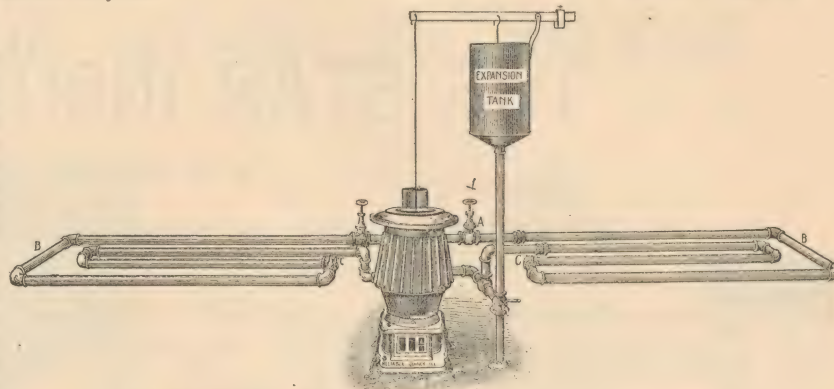
ATHENS, ILL., March 19, 1898.

Reliable Incubator and Brooder Co.:

Please send my rubber tube for my 200-egg size Reliable Incubator. Have machine in operation and the tube is broken.

forty eggs put in the machine. I took out the turning rack and filled the machine with eggs. Yours respectfully,

W. H. GRAHAM.



THE RELIABLE HEATER WITH DOUBLE COIL ATTACHED.

DIAGONAL, IOWA, Sept. 21, 1898.

Reliable Incubator and Brooder Co.:

Enclosed find 50 cents, for which kindly send me a bottle of mercury as soon as possible. I have had splendid luck with your hot-water incubator and I would have no other. Out of seven hatches I got 1100 chickens. A great many persons have been in to see the machine at work. I think I shall sell a few machines. They take the lead.

Yours respectfully,

R. C. SHOLL.

MUMMAVILLE, OHIO, May 5, 1898.

Reliable Incubator and Brooder Co.:

I have been making some good hatches with your machine, 95 per cent and better. Good enough. I never want better. It even hatches Killdear eggs. About three weeks ago in walking across the meadow I found four Killdear eggs which I immediately placed in the machine. Every egg hatched. It is nature in every respect. Yours respectfully,

A. M. MUMMA.

DENVER, COLO., April 13, 1898.

Reliable Incubator and Brooder Co.:

Inclosed you will find draft, for which please ship me one of your No. 3 hot-water incubators, same as you shipped me last. I have just finished the second hatch in the machine you sent me, and it rolled out ninety-five per cent of the fertile eggs left in after testing. I am more than pleased with the incubator and when I get into my new quarters, shall want about twenty of them. You have the only regulator on the market. Please send me this machine as soon as possible, and oblige.

Yours respectfully,

C. A. RIVERS, Box 519.

BUFFALO, ILL., April 22, 1898.

Reliable Incubator and Brooder Co.:

Inclosed you will find \$3.00. Please send me spray pump for use in hen houses and hog sheds. My incubator runs perfectly. Last hatch three weeks ago was ninety-four per cent of the fertile eggs. Another hatch comes off tomorrow. The hot-water sectional brooder is simply perfect. Put in one hundred and forty-seven chickens; only lost two so far and all are doing nicely.

Last year, first hatch, ninety-seven chickens out of one hundred eggs and raised ninety-three. Others did equally as well. Yours respectfully,

H. C. HARVEY.

FILLMORE, IND., Feb. 24, 1898.

Reliable Incubator and Brooder Co.:

I got 122 nice chicks from 140 eggs, which I bought as people brought them into the store, and the weather was very cold. There have been hundreds of people in to see our chickens, and they say it beats any hatch they have ever seen,

getting the eggs the way I did. Wishing you the success that your company deserves, I remain,

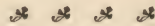
Yours respectfully, W. A. CRAWLEY.



OFFICE AND FACTORY.

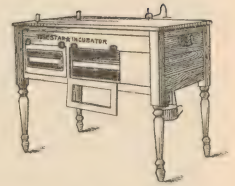
This is three seasons I have run the machine, and in every respect it is as good as new. I hatched two hundred and thirty-seven at one hatch last season out of two hundred and

THE STAR INCUBATOR

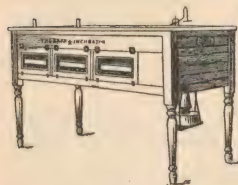


130 Egg Machine.

Is to-day the most simple and nearest perfect of any incubator offered to the public, and this claim is based upon the following facts: First, we use absolutely no artificial moisture because of our perfected ventilation. Regardless of the conditions existing in the room where the incubator is located (whether the air is very damp or dry), it is always in the same condition of dry-

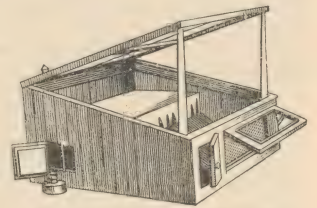


220 Egg Machine.



390 Egg Machine.

ness when it is discharged into the egg chamber, because the air is taken into the channels at the bottom of the machine, is carried upward next to the lamp flue and through the tank the entire length of the machine, and after it is subjected to this great heat it is always dry and warm. It is then moved through the egg chamber very slowly, and goes out the same end at which it enters, thereby keeping the chamber sweet and retaining in the machine the natural moisture evaporated from the eggs. This is why we claim no moisture and are able to tell you exactly how to set the ventilators regardless of the location of the machine.

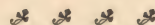


Hot-Water Outdoor Brooder.

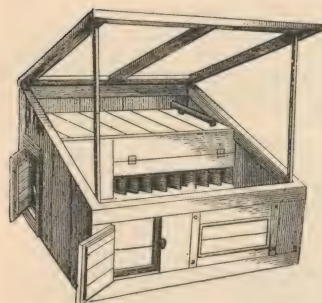
In regulation, our machines are positive, using a metal bar; there is nothing to get out of order and it will *always* work. We guarantee every Star Incubator to be *perfectly satisfactory* to the purchaser or it may be returned and the purchase price will be *refunded without question*.



STAR BROODERS.

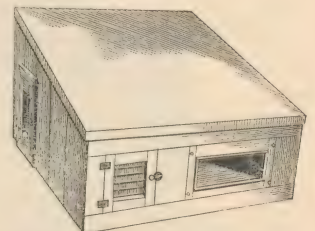


We manufacture the Hot-Water Sectional Brooders in one, two, three or four sections, and have the same regulator that is on the incubator. Our Hot-Water Outdoor Brooder is the



Outdoor Hot-Air Brooder (open).

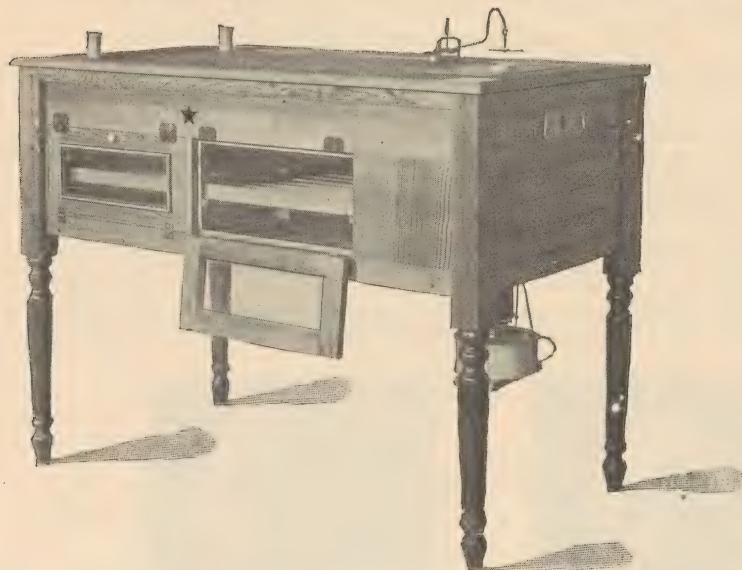
manifold pipe system same as indoor brooders: Size of brooder is 50x52 inches. Our Hot-Air Outdoor Brooder is in outside appearance same as the hot-water, and differs only in the heating apparatus and is not fitted with the movable floor. This brooder is to-day the best low priced brooder offered to the public. Size, 45x46 inches. All our brooders are fitted with the lighted brood chambers. We shall be pleased to furnish catalogue giving full description upon application.



Outdoor Hot-Air Brooder (closed).

Address, STAR INCUBATOR CO., Bound Brook, N. J.

TRIAL OF THE "STAR" INCUBATOR.



220-EGG SIZE STAR INCUBATOR.

Tested at "Elmwood" under Several
Conditions by Messrs. McGrew and
Randolph, for the Benefit of Those
Interested in Artificial Incubation.

To satisfy ourselves on the many disputed points regarding incubators, we concluded to give them a thorough test at "Elmwood Farm." Without any statement whatever of our intention to the Company, we ordered a Star Incubator sent to the farm about February 1st last. It came to hand and was placed in a room in the house on the ground floor, where the temperature changes considerably in all kinds of weather. We did not use moisture in or about the machine during the whole season.

In February we placed sixty Cochin and forty Cochin Bantam eggs in the machine. The result was that the machine turned out as large a per cent of chicks from the eggs as came from hens we had set at the same time so that we could have them to brood the chicks from the incubator. We could not notice any difference in the chicks when hatched, nor at this time, October 15th, 1898. Some of the Cochin pullets hatched in the machine are now laying—at seven months of age. Two Bantam pullets hatched at the same time and in the same machine have laid for some time, and we have a brood of twelve chicks from eggs laid by them.

The second filling of the machine was hatched in the same room with equally good results. Machine was then removed to the cellar and filled with 110 Cochin eggs. At the same time hens were set on Cochin eggs. When tested the machine was filled with fertile eggs that turned out 90 per cent of living chicks. Chicks produced at the same time under hens showed no better than those from the machine, and to-day no difference can be noticed in them.

For the next hatch we filled the machine with part Cochin eggs, the balance Bantam eggs. The result fully equaled the other hatch. At all times the machine did fully as well as the hens. The point most of interest to us was the fine condition of chicks when hatched and the personal proof that both Cochin and Bantam chicks from the Star Incubator mature as quickly and as perfectly as chicks from a hen.

T. F. MCGREW, New York City.
GEORGE B. RANDOLPH, Weston, N. J.

WORDS OF PRAISE.

Star Incubator and Brooder Company, Bound Brook, N. J.

CROTON FALLS, N. Y., August 10, 1898.

GENTLEMEN: In reference to the "Star," I beg to state that I have given it a thorough test, running it from March to July, which took me through the wet and dry seasons as well as the cold and hot seasons, and it has hatched all the hatchable eggs as well as a hen, and without a drop of artificial moisture. I notice one thing in favor of the "Star," and that is, **the chicks come out so strong that there is little or no mortality amongst them. Never in the past six years have I raised so many of the ones hatched as this season.** Next winter I shall get a 200-egg size "Star."

Wishing you the success you so justly deserve, I am,

Yours most truly,

E. P. SHEPHERD, Proprietor Croton Valley Poultry Farm.

THE \$5 CHAMPION BROODER.

Manufactured by J. A. BENNETT & SONS, Gouverneur, N. Y.

The \$5 Champion Brooder "is known by its works," which have placed it on the very highest pinnacle of success. Without question its record of successes have never been equaled by any other machine manufactured. It has been tested under the severest trials that portable brooders could be subjected to and it has never been known to fail. We give below a letter from Messrs. C. W. Hill & Son, of Norwich, Conn. Mr. C. W. Hill is Secretary of the New London County Agricultural Society and is a man of large experience in the poultry business.

J. A. Bennett & Sons:

NORWICH, CONN., February 1, 1898.

We wish to write you about what we did with one of your \$5 Champion Brooders. Into the brooder we bought of you we put, March 21, 1897, 40 chicks, and when they were seven or eight weeks old we sent them to the farm and raised 39 of them, one being picked to death by a hen on the farm that had a brood of chicks. We have just put a small hatch of chicks into the same brooder (January 31, 1898), and during the night, last night, we had about 15 inches of snow, and around the brooder it drifted and nearly covered the brooder up, but we kept the heat at 80 degrees on the outside of the mother part of the brooder and the little chicks are as lively as possible. We swear by the Champion Brooder.

Very truly yours,

C. W. HILL & SON.

The storm referred to in the letter is the great blizzard of January 30-31, 1898, in which many lives were lost and thousands of dollars' worth of property was destroyed. This blizzard was particularly severe in the New England states along the Atlantic coast, and was the severest storm that had visited the country in years.

It was with a great deal of pride and satisfaction that we learned how one of our \$5 Champion Brooders had been outdoors, exposed to its severity, and yet went through it without the loss of a chick. This trial stands alone as the most remarkable



JOHN E. BENNETT.



J. A. BENNETT.



C. A. BENNETT.

one known for a portable brooder, but it goes to prove our assertions, that it is a brooder house in itself, and that it will raise chickens and ducks successfully outdoors at any and all seasons of the year.

Here is a letter of general interest and value to prospective buyers of brooders. It is from a man who has made artificial incubation and brooding a life study. Many works on these subjects have been written by him and he is acknowledged by all poultry raisers to be one of our greatest living authorities on the above subjects:

J. A. Bennett & Sons, Gouverneur, N. Y.

BOUND BROOK, N. J.

GENTLEMEN:—Your brooder received. It is far better than I expected. I am well pleased with it. It is the best \$5 brooder on the market.

Yours truly, G. A. MCFETRIDGE.

Michael K. Boyer, poultry writer, author of "A Living From Poultry," "Broilers for Profit," "Profitable Poultry Farming," etc., and editor of *A Few Hens*, Boston, Mass., is running an experimental poultry farm in connection with his paper. Every month he makes a detailed report in it of his operations. After giving our \$5 Champion Brooder a trial on the farm, he reports as follows in the May, 1898, issue:

"The Champion Brooder, manufactured by J. A. Bennett & Sons, Gouverneur, N. Y., is giving the very best satisfaction, and after a fair trial we can safely recommend it. At \$5 it is the cheapest and best of the good brooders on the market."

This letter from the director of the poultry division of the North Carolina Agricultural Experiment Station, to the editor of *The Feather*, Washington, D. C., published in the April 15, '98, issue of *The Feather*, will interest you:

"Mr. F. E. Hedge, in charge of the poultry division of the N. C. Agricultural Experiment Station, Raleigh, N. C., writes us under date of March 23, 1898: 'If you want a real good small brooder, try a Champion, made by J. A. Bennett & Sons, Gouverneur, N. Y. It is as fine as split silk.' The Messrs. Bennett & Sons are among the choice list of advertisers that are now running in *THE FEATHER*, and we take pleasure in mentioning Mr. Hedge's remarks for the benefit of our readers who may be in need of such a brooder. Mr. Hedge also says, 'I have about 500 chicks out, the oldest being four weeks of age, and I have only lost five. They are doing well.'"

We have many more letters on file in our office equally as good as the above, but for lack of space we omit them and give a few from practical, every-day poultry raisers.

J. A. Bennett & Sons:

CHENANGO FALLS, N. Y., May 6, 1898.

DEAR SIR:—I want to say a word in praise of your Champion Brooders. They beat the old hen as mothers. I had a few January chicks which were very weak. They did not hatch out until the 25th day and then I had to help them out. The chicks were not worth trying to raise, but as I had just bought two of your brooders I thought I would give them a severe trial and see if they would bring death to life, and to my surprise they did, for in a day or two those chicks straightened up and were as smart as crickets. An old hen would have killed them all. I hatch largely with hens, but up to date (this spring) I have not used an old hen for a brooder and don't intend to so long as I can get the Champion Brooder. They need less care than the hen, the chicks grow one-third faster and they bring a larger per cent of chicks past the danger line. Wishing you success, I am,

Yours very truly,

HENRY TRAFFORD.

P. S.—Any one who is interested is welcome to write me about the Champion Brooders. Questions will be cheerfully answered.

This gentleman has had many years' experience as a breeder and ought to know something about brooders in general.

THE FIVE DOLLAR CHAMPION BROODER.

An Illinois breeder is so well pleased with his \$5 Champion Brooder that he writes as follows:

J. A. Bennett & Sons, Gouverneur, N. Y.

VIRDEN, ILL., April 18, 1898.

GENTLEMEN:—I received your catalogue and see that my certificate is in a prominent place, and I am very much pleased to recommend the Champion to my friends and all contemplating buying a brooder; and I take great pleasure in showing it to my friends, and the remark is, "aint the chickens doing fine." I have done all my hatching this year with five hens. The first hatch was 56 chicks; I have 42 of them in the brooder and 14 of them with one hen. While the brooder ones are a week and two weeks younger, they are growing the fastest and doing the best, and have not lost one of them. Several of them were late in hatching, I mean a day and two days over time, and very weakly, and I am satisfied would have died had they been with the hen, but they are growing finely in the brooder. If I only had a trio or could keep a trio of fowls, I should have a Champion Brooder to raise the chickens. Anything I can do in the way of recommending the Champion I will do cheerfully.

Yours respectfully,

FRED W. SILLOWAY.

We could give thousands of such letters of praise if we had the space. We have them on file and will show them to any who wish to examine them.

Now as we have told a few of the many wonderful performances of our famous \$5 Champion Brooder, we will tell why it can do such work and why it is always successful:

It is simple in construction and operation. The case or house is made of one inch matched pine, well painted. Every joint is glued and nailed; the corners are halved, glued and nailed both ways. The legs are 10½ inches high, thus keeping it up from the ground to avoid all dampness, to protect it from heavy rain storms and from snow. Hundreds of chickens have been killed by dampness and literally drowned during a heavy rain storm when kept in brooders that rested on the ground. The chickens in the \$5 Champion Brooder are always dry and comfortable, regardless of the condition of the weather.

The heater is a drum with radiating arms which distribute the heat to all parts of the brooder equally, preventing all crowding. Our radiator is the best one that could possibly be designed, as it not only distributes the heat perfectly but is so constructed that very little heat can escape outdoors, yet the draft is not interrupted, thus making it a most economical brooder to run. We give here-with two letters from breeders, in which they mention the small quantity of oil they require:

J. A. Bennett & Sons.

SCOTIA, N. Y., April 17, 1897.

DEAR SIR:—Enclosed find \$5, for which please send me one Champion Brooder complete. Send me your best brooder, No. 1, with a little bottom heat. The brooder you sent me is a daisy; it works like a charm: money could not buy it if I could not get another. I put in 53 chicks and have not lost one, and they are larger at three weeks old than any I ever had with hens. It is a wonder to me where all the heat comes from, for it burns so little oil. I can run it a week on a quart of oil; it is a complete machine. You may use me for reference if you choose, for your brooder will stand all you can give it.

A. WITBECK, Manager of Glenville Buff Yards.

J. A. Bennett & Sons.

WATERTOWN, N. Y., June 4, 1897.

DEAR SIR:—Received the brooder I ordered all right and am much pleased with it. Am glad you sent the No. 1; think you know what I wanted better than I did. Was surprised to find how little oil it took to run it. Will need more of them later.

Yours respectfully,

A. E. CHRISTOPHER.

Economy in operation is a point that should never be overlooked, especially if a number of brooders are used. The \$5 Champion Brooders use a wick three-quarters of an inch wide; the others use a wick one and one-half inches wide, or double the size of the former, hence our machine will use only one-half so much oil as any other made. The heating drum or radiator is made of tin and will last for years, as there is nothing to rust or leak. The lamp is made of tin and has a water jacket in which water is kept to prevent explosion or fire, making it absolutely safe to be used anywhere. The heat from the lamp, which sets under the brooder, in a box, rises up into the heating drum, passes into the radiating arms and is conducted outside through the sides of the brooder, preventing all gas and smoke from getting inside, to the injury of the chicks. Noticing the fact that while a hen was brooding her chicks the ground always was warmed a little, which kept the chicks' feet warm, we embodied this idea in the \$5 Champion Brooder. We put two bottoms in it and leave an air space between them, so a portion of the heat from the lamp chimney can escape under the floor to keep it warm and dry. Only enough heat escapes under the floor to keep it moderately warm; it is impossible for it to get hot. By this method the chicks' feet are kept warm, as in the natural way of brooding.

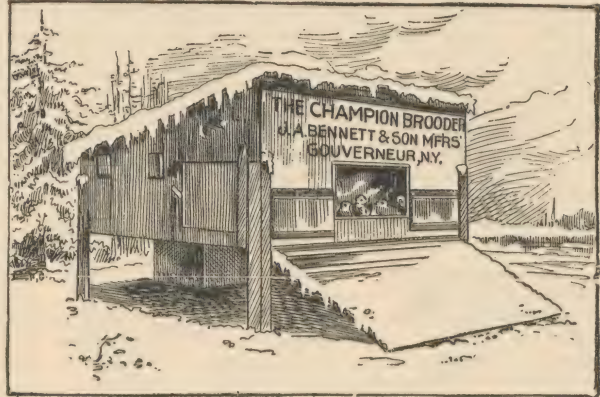
Many poultry raisers prefer top heat only, so we have made two styles. No. 1 has top and bottom heat; No. 2 top heat only. Both the same price. Another important feature, and one that is to be found only in the \$5 Champion Brooder, is the safety compartment which prevents all danger of overheating the chicks. This accounts for the vigor and sturdy growth made by chickens raised in it. The safety compartment is the front part of the brooder separated from the heating chamber, where the radiator is, by a partition of wood. This arrangement keeps the front part cooler than the brooding part, and effectually prevents overheating and furnishes a place for the chicks to exercise when closed inside the brooder on account of stormy or cold weather. The system of ventilation is perfect. A stream of pure, fresh warm air is constantly passing through the brooder. The quantity can be regulated at will by simply opening and closing the dampers at ventilator openings. Little wooden hoods cover the openings of the radiator, which extend through the sides of brooder. These hoods prevent the wind from affecting the lamp in the least. The strongest wind has positively no effect on the blaze, so it will run outdoors in all kinds of weather. Every \$5 Champion Brooder is well made by skilled workmen and carefully inspected and tested before leaving the factory, and is warranted to give entire satisfaction or money will be returned in full upon receipt of brooder, we to pay return charges on it. We have never had a brooder returned.

Many poultry raisers prefer the portable brooder to the pipe system for ducklings and broilers. The \$5 Champion Brooder is a first-class machine for such a system of raising ducks and chicks. They are placed in houses of any desired length, spaced off into pens six feet wide and twelve feet long, with a window in each pen. The brooder is placed near the back of the pen and the space in front should be sand and gravel, so the chicks can exercise outside the brooder. This system is a very admirable one for people of small means, as it is exceedingly cheap and practical. The largest breeders make use of this system for their young chicks until they are a few weeks old, when they are transferred to the pipe brooders. We are always pleased to give estimates and designs for such a brooder house, and can recommend the method as a very successful and profitable one.

Our catalogue is free and will describe more fully the merits of our brooder. Send for it. Price of brooder is \$5 each, either combination top and bottom heat or top heat only.

Lock Box 272A.

J. A. BENNETT & SONS, Gouverneur, N. Y.



AMERICA'S GREATEST PRACTICAL FOWLS

ARE BRED IN LARGE NUMBERS BY SID CONGER, HOPE, IND.

I own three large farms comprising nearly five hundred acres of land, and breed Barred Plymouth Rocks, White Rocks and White Wyandottes by the hundreds and thousands. Have been in the poultry business for years, have shown my stock at one hundred and twelve state and district fairs and at two hundred and ten poultry shows, many of them State and National exhibitions. My Plymouth Rocks won a majority of premiums at the great Columbian Exposition at Chicago, 1893. Since I began breeding and exhibiting fowls I have won 3,231 prizes on my Plymouth Rocks alone. In other words, I have bred, exhibited and won more prizes on choice Plymouth Rocks than any other five breeders in the whole world.

Read what the noted poultry judge and breeder, Mr. Theo. Hewes, said of my Plymouth Rocks in the December, 1898, issue of the Reliable Poultry Journal, pages 819-820:

"Sid Conger is as well known in the poultry world as any man in America. He is a farmer and is proud of it! He has between three and four hundred acres of as fine land as the sun ever shone on and it is kept in apple-pie order. There is not a stump or stone to be found on any of the cultivated land, and every fence and gate is substantial and in fine repair. There are no weeds growing in the fence corners or along the roads, and you can trace the lines left by the seed drills for half a mile without a break or curve in them.

"In poultry, Mr. Conger is simply at the top. Barred Rocks are his hobby and he is giving them the greatest attention. His Wyandottes, Langshans, Brahmas and Cochins are good, but his Barred Rocks are "paralizers." Mr. Conger told me at Indianapolis last fall that he could show me exhibition birds "by the acre," and he did all he agreed to. I have visited a great many yards in the past few years, but I must take off my hat to Sid Conger, for he showed me more good Barred Plymouth Rocks in one day than any other breeder ever showed me in the same length of time, and I did not see near all of them at that. They are scattered all over the county, and you can find them in lots of one to three hundred on a place, great big, deep bodied, low-combed, short-tailed cockerels, good in color and free from brass."

There is no better general-purpose fowl in existence than the Plymouth Rocks. The Wyandottes are a close second, but fall short one pound in weight. More Plymouth Rock broilers, roasters and table fowl are sent to market every year than of all other kinds of standard poultry combined, Wyandottes not excepted. As a matter of fact, it is a case of "heads or tails" which is the best for broilers, or as layers. *I can furn'sh either.* We raise our stock to sell, not to keep and look at. Can furnish Plymouth Rocks or Wyandottes for broiler purposes in lots of one to ten dozen head and eggs for hatching in incubators in hundred or thousand lots. All stock has farm range, is large, vigorous and productive. I care for my poultry in the same manner I do for my farm. I aim to have my farm and my poultry plant models in their line. Write me full particulars, telling me just what you want and I will do my best to please you.

SID CONGER,

BOX 400, HOPE, IND.

CRESCENT FARM, KENT, OHIO.

ATTENTION! Twenty-three years' experience in breeding and hatching poultry enable us to furnish what you want. Crescent Farm claims your attention. Why?

Because, 1st, We breed only the three standard varieties, each acknowledged to be superior in its particular line.

(a) Our White Leghorns lead all other breeds for eggs, in number, size, color and quality. They are the egg producers and money makers. We have the best, and have proved it.

(b) Our Barred Plymouth Rocks are the fowl for the table. They produce the finest and tenderest meat, and make the best broilers. Our stock is bred for this purpose.

(c) Our Buff Cochins are the leaders, from the fancier's standpoint. Our prize winnings prove that we have the cream of this breed. It is one of these three breeds that you must have, if you expect permanent success or continued prosperity. The study of this book sustains what we have said. That is why.

Because, 2d, Long experience has taught us how to feed, mate and house our birds for the best results in stock and eggs. You get the benefit of our experience.

Because, 3d, Our birds are raised on farms with unlimited range and pure running water, and are marvels of size, strength, vigor and beauty. That is why our business has grown as rapidly, and that is why we can do you good.

Because, 4th, We pay particular attention to the egg trade, and guarantee everything we send out. We furnish fertile eggs and also stock that will produce good, fertile eggs. Incubator eggs a specialty.

TRADE MARK.

Because, 5th, The editor of the Reliable Poultry Journal, after personal inspection, is able to say this of us: "At the time of our visit the entire farm was in first-class order, the houses newly whitewashed on the interior and in ship-shape for winter. The birds reflected, in their good condition, the excellent care taken of the yards and buildings. It is encouraging to find in the poultry business such men as Messrs. Ladd and Blood. We feel no hesitancy in recommending such men. We know that they will do exactly what they agree to do. Such men do the business good. They are the foundation of the business. They are as safe to deal with as a sound bank.

Because, 6th, We have established a trade mark which is everywhere recognized as a guarantee of honorable dealing and superior goods. Beware of imitators assuming our name. This is the original Crescent Farm, and that is why we have a place in this book. Always look for our trade-mark. Send for a circular.

Address

E. T. BLOOD, Manager, Box C, KENT, OHIO.

HENRY M. LADD, D. D., Proprietor, CLEVELAND, OHIO.

WHITE WYANDOTTE—AMERICA'S GREATEST GENERAL PURPOSE FOWL.

AS BRED BY ARTHUR G. DUSTON, MARLBORO, MASS.

It is now generally conceded among well informed poultrymen that White Wyandottes positively make the best broilers. Repeated experiments have demonstrated this fact and I doubt not that several of the disinterested contributors to this book have endorsed White Wyandottes for broiler purposes. As for myself, I devoted years to the broiler business, experimented carefully with several of the best breeds for broilers and without any other object in mind than to find out which breed and variety is best for broilers, I found that the White Wyandottes "filled the bill." No matter at what age or weight White Wyandottes chicks are killed, dressed and sent to market, they are as plump as quail, dress clean, free from dark pin feathers, with yellow skin, making them attractive in every way and quick sellers in any market. Certainly the White Wyandotte is an ideal fowl for broilers. I really do not know how it could be improved upon.

When it comes to egg production, the Wyandottes are the equals, if not somewhat the superiors of Plymouth Rocks. It is generally acknowledged that they are the equals of Plymouth Rocks in this respect, and I claim, on the strength of personal knowledge and the results obtained by other breeders, that they will average more eggs per hen per year than the Plymouth Rocks, especially in our northern latitudes, for the reason that having low rose combs which do not freeze and are not bitten by the frost—thus checking egg production—they lay more eggs during the time of the year when eggs are most in demand and are worth the most money. I am sure they lay more eggs at the time of the year when persons who are operating incubators want them, and this is what a majority of the readers of this book are interested in. "Business is business," should be your motto in poultry raising as well as in any other business undertaking, and the variety of fowls that will serve your interests best is the one you should use.

The White Wyandottes lay a brown tinted egg of medium size, an egg that is generally well fertilized and easily hatched. They are much better fertilized as a rule than the eggs of the larger breeds that lay eggs somewhat larger, with thicker shells. Judged as layers, the White Wyandottes are unexcelled for the uses of the broiler man.

If I have made any success in breeding White Wyandottes, it is because I have carefully selected my breeders each year, heading my pens with the best males I had, and never have I spared any expense to get the best obtainable in new stock. The winter of 1898 will be no exception, for I

never had so many deep-bodied, well-marked birds as this year. I shall "put up" something very choice this season, having about twenty-eight pens on the home place, and on outside farms twenty to twenty-five more, making about fifty pens that I shall sell eggs from the coming season. I have about 1,000 birds to sell during the winter of '98 and '99, and shall, as formerly, send out such birds as will prove a good advertisement for me. I have many letters on my files from persons who bought eggs and stock of me last year, who wrote,



WHITE WYANDOTTES.

First Prize Breeding Pen, Great Boston Show, Jan. 18-22, 1898. Bred, Owned and Exhibited by Arthur G. Duston, Marlboro, Mass.

giving a list of their winnings. There is hardly a show of any size in which Duston's stock does not land first. It is a matter of principle with me not to publish the names of persons who win with my birds. They bought all rights with the stock or eggs.

My prices for standard birds are as follows: Breeding females, \$2 to \$5 each; males \$3 to \$10 each. Exhibition birds a matter of correspondence. Eggs, \$3 per sitting or four sittings \$10; \$15 per hundred. Incubator eggs, \$6 per hundred.

When writing please mention this book.

ARTHUR G. DUSTON, Box 2002, Marlboro, Mass.

AN OPEN LETTER

To The Readers of Artificial Incubating and Brooding.



THE J. W. Miller Co., of Freeport, Ill., wish to announce to you that they are extensively engaged in the breeding of Standard Poultry. They have made this their exclusive business for years, in fact, are giving the best years of their lives to the work of trying to improve the poultry on every farm in the country. If you are interested in "better poultry and more of it," and we are sure of this, for if you



MR. J. W. MILLER.

are not you would not be reading this book and this letter, we ask you by all means to send for our great catalogue, which will be mailed to you free if you will state that you saw our announcement in this book.

Common sense is what you should use when buying standard-bred poultry. There are a great many breeders of poultry, all claiming to have the best, but what you want to know is, who will give you the best satisfaction and the best value for your money. We have thousands of customers who are well pleased with our stock and our way of doing business. If you are breeding poultry at the present time, or expect to in the near future, it will be necessary for you to purchase either fowls or eggs to begin with, or in order that you may introduce new blood into your flock.

We are breeding on several farms, forty-two of the most popular varieties of poultry, including chickens, ducks, geese and turkeys. Our fowls are all farm raised, are therefore strong and vigorous and just such stock as you should have to start with, or to put new vigor into your present flock. We do not claim that our fowls are better than those of any other breeder, but we do claim that, prices considered, we can and do give more for your money than any other breeder will that we know of. Our surplus this year consists of a fine lot of choice specimens, and we are making special low prices, same to continue until our surplus is all sold.

We publish each year the best poultry catalogue sent out by any breeder of standard poultry. As evidence of the amount of business we do, we will simply state that we have issued for the season of 1898-1899, 40,000 copies of our catalogue. To be able to establish a business of this magnitude means that we have conducted our business on an honorable basis and treat our customers right. This season's catalogue is brim full of valuable information for any one interested in poultry. It tells all about our poultry, is finely illustrated, gives prices of our fowls and eggs, tells you how to care for and feed your poultry, gives valuable remedies for poultry diseases, plans for poultry houses and much other valuable information regarding poultry. As stated above, if you will mention Artificial Incubating and Brooding when writing to us, we will send you this book free of charge, the regular charge for which is 15 cents per copy.

Permit us to say that we are always prepared in season to fill large orders of breeding stock suitable for broiler purposes, also eggs from Plymouth Rocks, Wyandottes, etc., in hundred or thousand lots at reasonable prices. Where large shipments are required, it is always best to write us full particulars and we will quote you prices by return mail. We are prepared to furnish very fine Pekin ducks in large numbers, also Pekin duck eggs by the hundred or thousand. Send at once for a copy of our poultry catalogue and guide, then send us particulars about the fowls or eggs you want to buy and we will answer promptly, giving you our lowest price. Address

THE J. W. MILLER COMPANY.

.....BOX 400.....

FREEPORT, ILLINOIS.



As we have the largest combination poultry plant in America, many of the readers of Artificial Incubating and Brooding may be interested in the size and capacity of some of our buildings, also in our methods, our stock, etc. The farm proper contains one hundred and thirty acres, to which our young stock have access until ready to go into winter quarters. This, together with the scratching shed houses used for laying stock, and the perfectly heated and ventilated incubator and brooder houses accounts for the strong, vigorous stock we raise and offer for sale. We sell thousands of eggs for hatching and received but a very few complaints about the fertility, owing to our care and method of feeding.

Our capacity is about fifty thousand birds per annum, as follows: High grade breeders and exhibition stock in White Wyandottes, White and Barred Plymouth Rocks, S. C. White Leghorns and Pekin Ducks, broilers, roasters and ducks for market. Our prices are as low as is consistent with the quality of stock we ship, and as we have thousands to select from it enables us to give full value for all money received, in fact, we guarantee satisfaction in every case.

Our prices on good breeding fowls are, females, \$2 each; males, \$3 each; Pekin ducks, \$1.50 to \$3, drakes \$2 to \$5 each. Exhibition stock or exceptionally fine breeders is a matter of correspondence, all letters being cheerfully answered. Eggs for hatching, one sitting, \$2; two sittings, \$3.50; 100 eggs, \$8; per 1,000, \$70, all well packed and delivered to express company here.

We are prepared to handle with care and judgment export orders for a single fowl or five thousand at a shipment. We also furnish plans for erecting poultry plants of any size, giving cost, etc. Plainfield is only forty-four minutes ride from New York, on the New Jersey Central railroad. Come to see our stock before you buy elsewhere, there is none better. Some of our buildings, etc., which may be of interest are: Main laying house (scratching shed plan) for fowls, 240x14 feet, with four-foot alley in rear; fifty laying houses, 20x8, same shed plan, and about twenty-five other laying pens, making over fifteen thousand square feet of floor space. There is a laying house for ducks, 400x14 feet, with feed house attached and a feeding railway, both inside and out, its entire length, making eight hundred feet of track, from which the ducks are fed, outside in good weather, and inside when the weather is too bad.

Our incubator capacity consists of forty Cyphers machines, each holding three hundred and sixty hen eggs. They occupy a one hundred-foot building, with egg room attached and connected to same heater, and a sleeping room for the attendant. The incubator room is connected by passage to nursery, or baby chick house, so the chicks are not exposed to any cold air in reaching their brooders, which are heated by the hot-water pipe system. The chicks remain in this nursery brooder for three to four weeks, when they are transferred to brooder house No. 2, which is 235x14 feet. From there they either go to market as broilers or into colony houses scattered over the farm, where they enjoy free range until maturity. The duck brooder house contains seven hundred and sixteen running feet of hovers, the building being 360x33 feet. It has a capacity for eight thousand ducklings at one time, ranging from one day to eight weeks old. Our feed house, killing house, water supply, etc., are all on the same extensive plan. The lands, buildings and stock now represent a value of about forty-five thousand dollars. Circular free and visitors welcome.

PLAINFIELD POULTRY FARM CO.,

S. B. CORBY, Manager.

MICA-CRYSTAL.

SIXTH YEAR OF SUCCESSFUL

INTRODUCTION.



THE STANDARD POULTRY GRIT

OF AMERICA.

It has been a slow and laborious undertaking to convince poultry users of the true worth and merit of 'Mica-Crystal Grit.' The fact that the sales have doubled each succeeding year would seem to imply the retention of old, and the addition of new, customers.

So we are encouraged to go on with the manufacture of hen's teeth of the latest and most approved style.

Below are a few reasons why "Mica Crystal Grit" fills the bill to its fullest capacity.

If poultrymen in purchasing **GRIT** would keep in mind the fact that what they want is a **GRINDER**, common experience should then teach them that the first test of a **GRINDER** is its **SHARPNESS**, and second, its **ABILITY TO REMAIN SHARP**, or the possession of some quality that permits it to **RESHARPEN ITSELF**; the fact that it possesses other qualities (more or less beneficial to the poultry), while they add to the value of the grit, are but of secondary consideration.

Crushed oyster shells, although apparently hard, and possessing sharp edges, are so largely composed of lime, that they are **PRACTICALLY DISSOLVED** by the fluids in the crop, and such portions of them as do remain are **USELESS FOR GRINDING PURPOSES** when they reach the gizzard.

Many people simply consider the looks of the article, forgetting that the **NATURAL INSTINCT OF THE FOWL** is a better guide than the "eye of the master."

Again a grit may be of too hard or too soft a substance. If too hard, the action of the gizzard will soon reduce the sharp substance to a **SMOOTH PEBBLE**, something that will **SLOWLY CRUSH**, but **NEVER GRIND**; if too soft, **LIKE ALL LIMESTONE GRITS**, they quickly go to pieces, without accomplishing the desired results.

It is in such a **PRACTICAL CONSIDERATION** of the different kinds of grit now offered for sale on the market, that the **TRUE WORTH** of "Mica-Crystal Grit" is seen and understood, and entitles it to be called the

MONARCH OF THE POULTRY YARD.

"Mica-Crystal Grit," be it understood, is made from a **ROCK OF PECULIAR FORMATION**, composed partly of quartz, which is the hardest of rock substances and partly of mica, which is a flaky substance. These two substances are piled in countless layers, one upon the other, thus forming what is termed a **flaky or friable rock**, by which is meant a rock which, when subjected to pressure, will **scale or flake**; the sharp particles of quartz are, as it were, embedded in mica, so that the rotary motion of the contents of the gizzard, in bringing the different pieces of grit in contact with each other, causes small particles to flake off, thus constantly resharpening themselves until they are entirely used up.

Many tests have been made to demonstrate the worth of "Mica-Crystal Grit," and in every instance, no matter how small the particles were remaining in the gizzard they still retained their **sharp cutting edges**.

The iron in "Mica-Crystal Grit" is practically all contained in the mica, and is in its purest and best form.

The effect of the iron in toning up the physical condition of your poultry, and the high yellow color produced in the yolk of the egg, is, of itself alone, worth more than all the other grits combined.

WESTERN WHOLESALE DEALERS.

RELIABLE INCUBATOR AND BROODER CO., Quincy, Ill.

DARLING & CO., Chicago, Ill.

SPRAGUE COMMISSION CO., Chicago, Ill.

F. S. BURCH & CO., Chicago, Ill.

GRIGGS BROTHERS, St. Paul, Minn.

NORTHROP, KING & CO., Minneapolis, Minn.

T. LEE ADAMS, Kansas City, Mo.

JACOBY BROS., St. Louis, Mo.

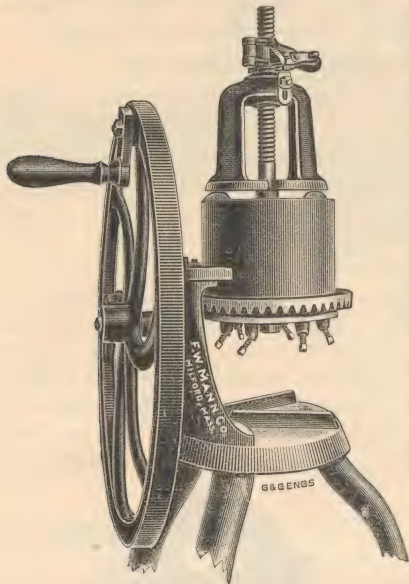
IOWA SEED CO., Des Moines, Iowa.

JOSIAH LIVINGSTON, Des Moines, Iowa.

NEBRASKA SEED CO., Omaha, Neb.

GREEN BONE CUTTERS.

POULTRYMEN have made unsuccessful efforts to substitute some other food for Green Cut Bone, something that could be had without any work; but always with the same poor result. To obtain the most eggs in winter, as well as the most fertile ones, to keep the birds vigorous and healthy, to get the best birds for the show room, or highest points in scoring, the observant poultryman has never yet found any food equal to Green Cut Bone. It always proves to be labor well spent to prepare it properly and feed it regularly. It should never be fed unless it is strictly fresh. When tainted it is always dangerous, and will almost certainly result in sickness among the flock.



MANN'S BONE CUTTER.

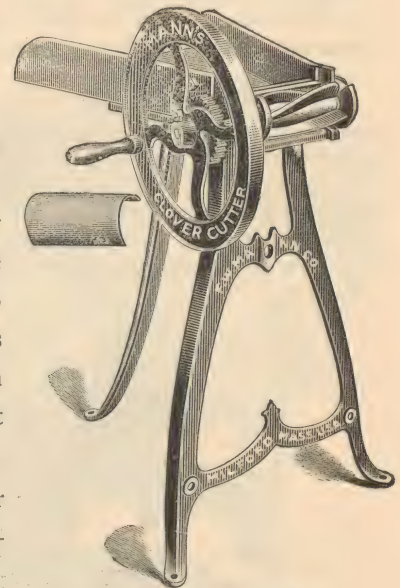
With a Mann's Bone Cutter the labor of cutting bones is reduced to a minimum. The automatic feed so regulates the power, that a child or woman can operate it. This can not be said of any other bone cutter; and this fact alone makes them the most desirable, as well as the easiest running machine on the market. But this is only one of the many points of superiority of Mann's over others. It is scientifically constructed throughout. The principles are right, and the material and workmanship are first class in every particular. The firm is the oldest in the history of Bone Cutters, and have a reputation gained by years of fair dealing. Mr. Mann, the inventor, is a graduate of Cornell University, where he took a thorough mechanical course, thus insuring the very best "up-to-date" mechanical ideas in all parts of construction.



CLOVER CUTTER.

He has recently been devoting a portion of his time in perfecting a Reliable Clover Cutter, one which would do the work easily and rapidly. His efforts have met with the most flattering success. The Clover Cutter we manufacture is very far ahead of anything ever offered, and is at the same time very reasonable in price. Steamed Cut Clover now ranks so high as a ration, that it is included by all poultrymen in the diet. This renders a good Clover Cutter indispensable. Purchasers can rely upon Mann's meeting every requirement, and be assured that no disappointment will follow an investment in one.

We warrant all our goods, and aim to obtain the good will of all our customers, by sending them articles of real worth, with the very best "up-to-date" improvements.



MANN'S CLOVER CUTTER.

F. W. MANN COMPANY,

MANUFACTURERS OF MANN'S BONE CUTTERS,

MILLFORD, MASSACHUSETTS.

THE DANDY GREEN BONE CUTTERS.

MANUFACTURED BY STRATTON & OSBORNE, PATENTEES, ERIE, PA.

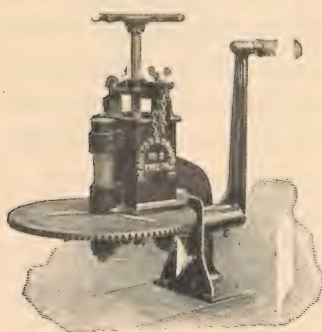
WE are now entering upon the fifth year in the manufacture of the Dandy Green Bone Cutters. Each year we have been obliged to add new machinery in order to be able to keep up with our orders, and the past year our sales were three times larger than they were the season before. We think that we have worthily won the reputation our machines now have, and it shall be our effort to maintain this reputation. We believe that the Dandy is the best green bone cutter that has been placed on the market. We believe this not only as a result of our knowledge of

mechanics, but because of the hundreds of testimonials we have received from customers who have put our green bone cutters to a practical test.

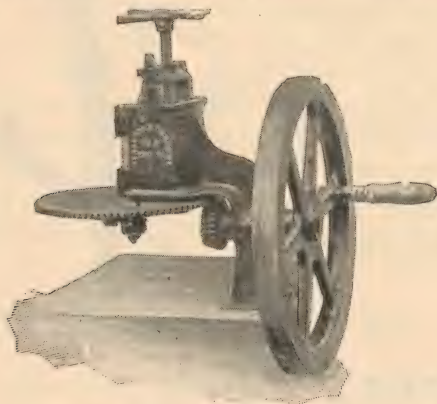
Our catalogue, which will be sent free to any reader of this book contains many testimonials from all parts of the country. It has been our constant aim not only to build up an unequaled reputation for our goods, but also for honesty and fair dealing, and every

one receiving our catalogue is invited to write to the persons whose testimonials we have printed therein, and we believe you will receive a reply in every case, speaking in terms of praise not only of our cutter, but also of our treatment of our customers.

We present on this and the following page illustrations showing several of our machines, both the old and new styles, those without gearing and the geared machines. Our geared bone cutters were placed on the market last season. We had received calls for geared bone cutters, hence decided to place a full line of them on the market. The geared cutters turn easier, but are somewhat more expensive. It is the exception



\$5 DANDY CUTTER.



\$7 DANDY BONE CUTTER.

where one of our customers speaks of the Dandy Bone Cutter being hard to operate, but the gearing makes them turn easier and cut faster, hence is an improvement. All our cutters except No. 0, have an automatic feed, and the feed is adjustable. We have not only tested all our geared machines our-

selves and found them to be perfect bone cutters, but have received splendid testimonials from every one we have sold.

OUR CUTTERS ARE WARRANTED.

We manufacture bone cutters of all sizes, from the \$5 machine—intended for small flocks of poultry—up to the largest sized, \$100, geared, power machine, the hopper of which holds nearly a bushel of green bones at a time. We illustrate herewith five different sizes and styles of our machines. For other styles get our latest catalogue. Every machine we send out is warranted as follows:

"Should the machine not suit you, and is not what you want, we will, without making you the least trouble take it back and *at once* return you your money. Should any part of the cutter break within one year we will replace the broken part and make no charge for same, but if sent by express we can not pay express charge. We replace the broken part, and you pay what little it costs to get it to you. Should you



\$10 (MOST POPULAR) DANDY GREEN BONE CUTTER.

ever have trouble with your cutter in any way, let us know and we will cheerfully help you out."

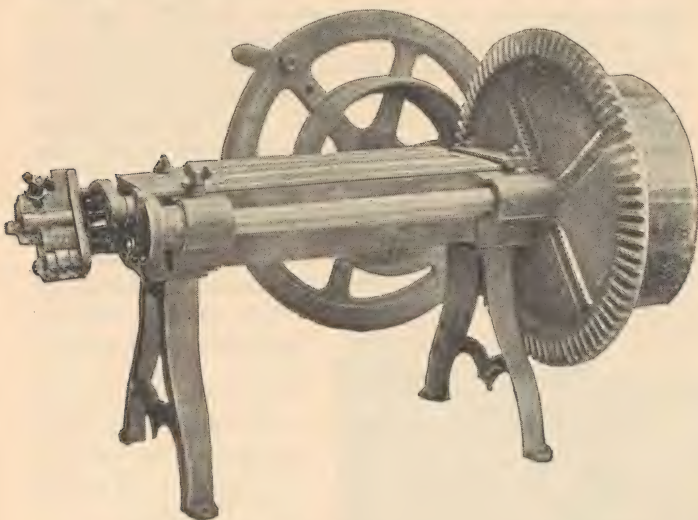
Not only this, but we sell the Dandy Bone Cutter on trial. We will send a machine on trial to any responsible person whose application is accompanied by the name and address of some reliable business man, who has a commercial rating, living in the same town or county the applicant does—all of which is fully explained in our catalogue.

BENEFITS OF FEEDING GREEN BONE.

Green bone makes hens lay during the winter months when eggs mean money, for this is when they bring the highest prices. It does not pay to wait till late spring for an increased egg supply, for then everybody's hens are laying and prices are away down. Green bone is cheaper than wheat, yes, and it is cheaper than corn, measured by its low cost and its great value as an egg food. It is conceded to be the greatest egg food known to poultrymen. Fresh scrap bones can be bought at any butcher's, and the Dandy Bone Cutter will do the rest. It will save you on your feed bill and will double the egg yield, thus earning you money at both ends of the line.

THE DANDY GREEN BONE CUTTERS.

Says the *Poultry Herald*, of St. Paul, Minn., "Green bones, those from the butcher, can not be ground as they are too tough, containing a large share of water or blood. They must therefore be cut with a bone cutter. When bones become very hard and dry, they can be ground, but will then have lost a large proportion of their nutritious matter. Green bones are rich in nitrogen, and, therefore, serve as food. When a bone contains a large share of adhering meat it is all the more valuable. Bones serve several purposes when used for poultry. Being phosphate of lime, they are capable of being digested,



NO. 13 GEARED (HAND OR POWER) DANDY BONE CUTTER
PRICE \$20.

which is not the case with oyster shells and grit, and they supply the birds with elements that may be lacking in the food. They also assist in grinding the food, taking the place of grit, and are readily accepted by all classes of poultry. In fact, it is safe to claim that there is nothing that can be used as egg-producing food which serves the purpose so well as green bone. Its combination of qualities—nitrogen, lime for egg-shells, cost and adaption to all fowls and all ages—gives it a place even higher than meat, which contains nitrogen, but no lime or other mineral matter.

"When grain is the principal food the hens are sometimes unable to produce eggs, because while the materials for forming the yolk are plentiful, the elements required to produce albumen and the bony parts of the chicks, as well as the shells of eggs, are lacking. Bones supply these deficiencies, and thus increase the production of eggs. When the cost of the bones is considered and compared with the increase of eggs, resulting from the feeding of bone, its cheapness is at once apparent. The reducing of bones to sizes suitable for the fowls is difficult, unless one has the appliance for so doing.

"The bone cutter should be a regular implement with all poultrymen. Its cost may be an item at first, but the great service it performs by enabling one to use a material that could not otherwise be made serviceable, makes it really cost less, as it soon repays for the outlay. A bone is too hard when dry and too tough when green, to be pounded. Labor is too valuable to be wasted at such work. If hens are intended to lay they are but themselves machines for converting raw materials into something more salable, and the additional machine—the bone cutter—will give them better opportunities for producing a profit."

The *Poultry Keeper*, P. H. Jacobs, editor, says: "A pound of cut green bone is sufficient for sixteen hens one day, which means that one cent will pay for that number of fowls. If one quart of grain be fed at night to sixteen hens, and one pound of bone in the morning, it should be ample for each day in winter. In summer only the bone need be given. Such diet

provides fat, starch, nitrogen, phosphates, lime and all the substances required to enable the hens to lay eggs. As an egg is worth about three cents in winter, it is plain that it is cheaper to feed bone than grain, as the greater number of eggs not only reduces the total cost, but increases the profit as well.

The bone cutter is as necessary to the poultryman as his feed mill. It enables him to use an excellent and cheap food, and gives him a profit where he might otherwise be compelled to suffer a loss. It is claimed that the bone cutter pays for itself in eggs, and really costs nothing. Bones are now one of the staple articles of food for poultry, and no ration should have them omitted. They are food, grit and lime, all combined in one and the hens will leave all other foods to receive the cut bone. If cut fine, even chicks and ducklings will relish such excellent food, while turkeys grow rapidly on it. To meet with success requires the use of the best materials, and green bone beats all other substances as food for poultry. There is quite a difference between the green, fresh bone, rich in its juices, as it comes from the butcher's and the hard, dry bone which has lost its succulence. The value of all foods depends largely upon their digestibility, and the more this is provided for the greater the saving of food, and the more economical the production of eggs."

A boy or woman can, if necessary, operate a Dandy Bone Cutter with ease. This we positively guarantee. Here is the proof:

WATKINS, IOWA, March 31, 1898.

Stratton & Osborne, Erie, Pa.

GENTLEMEN:—It is now two years since I purchased a No. 2 Dandy Green Bone Cutter from you and I wish to say that it gives the most perfect satisfaction and is in as good order and seems to be just as good in every way as it was the first time I used it. I fill the box three times for a feed for my 160 hens. It is very easy to run, and I would not part with it for anything.

MRS. M. E. BOWER.

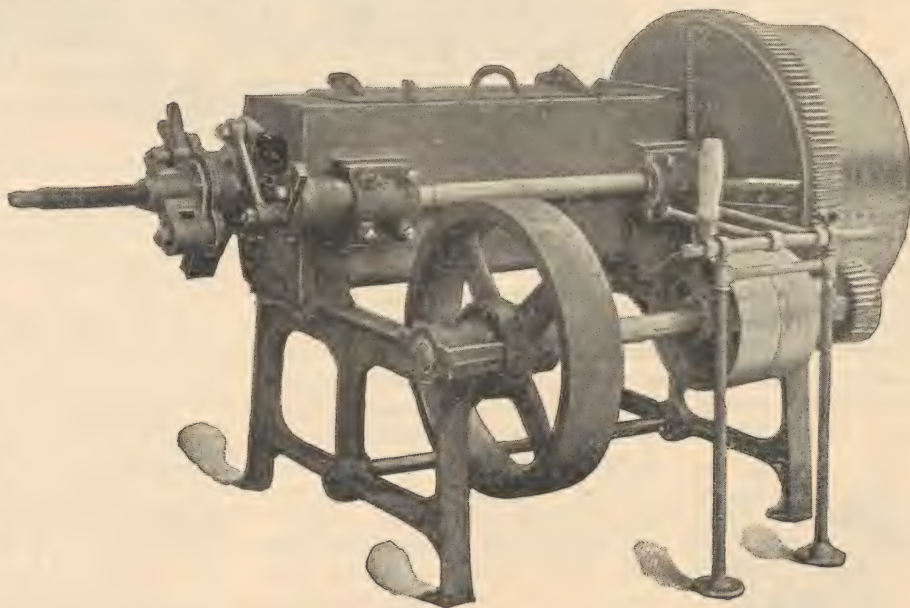
PASCO, WASH., December 13, 1897.

Messrs. Stratton & Osborne, Erie, Pa.

GENTLEMEN:—The Bone Mill No. 3 arrived in good condition and gives perfect satisfaction. My little nine year old boy ground bone nearly the whole of the first day it was here, declaring it was fun, and I was glad at last there was something useful he liked to do. I have been a long while getting this note written, but have been very busy.

Respectfully, MRS. H. M. WHYBORN.

Hundreds of other similar testimonials furnished on demand—see catalogue.



LARGEST SIZED, GEARED, POWER DANDY BONE CUTTER, PRICE \$100.

The Dandy is positively the best bone cutter made. It is lowest in price value considered; it is easiest to fill, will take the largest bones, is the easiest to operate, cuts the finest, has an automatic feeder, is, in fact, a green bone cutter without an equal. Our latest, finely illustrated catalogue containing many recent genuine testimonials will be mailed free to any reader of this book. Kindly state that you saw our announcement in these pages.

STRATTON & OSBORNE.

PATENTEES AND SOLE MANUFACTURERS, ERIE, PA.

PIONEER CLOVER MEAL.

THE production of eggs is the all important point in poultry keeping. Until they are obtained or produced profits are never known. When the important egg is supplied all the sources of profit in the poultry business are opened up and take a tangible form in the shape of dividends, the "ends" all poultry raisers are struggling to attain.

Eggs are a very common article of commerce, except when they are worth the most, which is when our hens cease to lay. This takes place generally in the winter season and eggs go up in price and there is a big demand. In the past it was accepted as a fact that it was the cold weather which prevented the hens from producing, and so it is we admit. But it is not because the fowls were cold, it is only that the cold weather killed the green food, which the hen secured in the summer, and buried it under several inches of snow. This green food is absolutely essential to the production of eggs, as all poultry raisers now agree. All that is necessary to get eggs in the winter is to supply this green food in connection with their other rations and keep the fowls from freezing.

Another fact of more recent date that is acknowledged is that Pioneer Clover Meal is the only perfect substitute known for green food, for it is the natural green food dried, ground into a fine meal and carefully sacked. Pioneer Clover Meal has attained its popularity with poultry raisers on account of its practicability, economy and value. Clover is known to be the greatest egg maker extant. It contains more of the elements of the egg in the best possible form for assimilation than any other food. There is no article of food that will take the place of Pioneer Clover Meal, which is pure ground clover hay. It stands alone in its peculiar combination of valuable food elements. One hundred pounds of Pioneer Clover Meal contains thirty times as much lime as the same quantity of wheat, and will furnish the shells for seventeen and one-half dozen eggs. Wheat will supply the shells for six only. Thus it will be seen that Pioneer Clover Meal will supply a hen with all the lime required for shells, and that grain alone will not meet a hen's requirements. In the nitrogenous elements (egg forming materials), also called albumin and protein, Pioneer Clover Meal is equal to wheat, pound for pound. One hundred pounds of wheat contain eleven pounds; Pioneer Clover Meal about the same amount. It also has the great ad-

vantage over wheat of being almost entirely an egg forming food, while wheat contains much fat producing elements.

Pioneer Clover Meal is not rich only in lime and nitrogen, sulphur, magnesia, soda and phosphoric acid, but also contains potash and carbon. All the above elements are to be found in the egg and are essential to fowls that are kept for laying purposes. Although Pioneer Clover Meal is fine as middlings it is a bulky food; that is, it is light (one bushel weighs only about sixteen pounds) and when mixed with ground grains it forms the most perfectly balanced ration that can be fed to poultry. As it is bulky it is easily assimilated and digested, and diluting the concentrated grain makes the grain more easily digested and far more valuable. The great bane of laying hens is the liability to get overfat when fed grain

alone, and thus stop egg production and produce disease. Pioneer Clover Meal fed in the morning mash in the proportions of one-half, by measure, the balance being ground grains or vegetables, will avoid this condition.

Pioneer Clover Meal has been used and is recommended by the most eminent poultry editors, writers and breeders. Below we give a few extracts from some of our leading journals, edited by men of unquestioned ability, gained through years of work and study in poultry raising:

The Poultry Keeper, Parkesburg, Pa., January 15, 1898, P. H. Jacobs, editor:

"Clover Meal is receiving considerable attention just now, and in order to assist our readers we make a reply to the following in relation to it. The letter is from a subscriber at Davenport, Iowa.

"What do you think of the Pioneer Clover Meal? Is it better than cut clover, or is it as good? I always thought one had to have the bulk as well as the quality of the clover. It is very hard to get clover around here. I would like to know how much to feed six chickens."

"Clover Meal is simply clover hay ground fine, after being thoroughly dried, but of course by some process best known to those who prepare it. We received some to test and found that the fowls were very partial to it, and we gave it dry, moist, and mixed with meal. Even if clover hay is preferred it should be as fine as it can be cut. Clover meal does not cause crop-bound, and if moistened with water it has considerable bulk. It serves as a dilutant to grain, and two ounces per day of dry meal, moistened, will serve for six hens, though if twice that quantity is given it will do no harm, as it is nutritious and wholesome. We recommend that it be scalded and then thickened with equal parts of meal and middlings.

"One advantage in its use is that it saves labor, and is always ready, even for the smallest chicks. Of course, it costs something to grind it, but it is then in a convenient form to be sent anywhere, and as a food it serves as an agreeable and pleasant change from the usual bill of fare.

"Clover hay, or clover meal, contains more than twenty times as much lime (for the shells), as corn contains more protein than any kind of grain, and nearly as much solid matter



MILL WHERE PIONEER CLOVER MEAL IS GROUND.



THE BENNETT & MILLETT COMPANY.

as corn, that is, one hundred pounds of Clover Meal contain fourteen pounds of water and corn ten pounds, hence it is a concentrated food and very nourishing. Pour boiling water over it and it becomes fit for any kind of fowls—geese, ducks and turkeys included. For chicks it is one of the best materials out, but never allow portions to remain in the trough after the chicks have eaten, as any food that has been moistened is liable to fermentation.”

A Few Hens, M. K. Boyer, editor, one of our foremost poultry authorities:

“We have given the Pioneer Clover Meal, manufactured by the Bennett & Millett Co., Gouverneur, N. Y., a trial, and so far are well pleased with the results. Being reduced to a fine state, it readily mixes with the ground grain. At present we are mixing it dry with H-O feed, and meat scraps. After the three articles are thoroughly incorporated we pour hot water over the mixture, and work it into a crumbly state, allowing it to cool off a little before feeding. The hot water coming in contact with the cold ground grain, soon cools suf-

Our Pioneer Clover Meal is manufactured, by a special process, from the very finest quality of pure clover hay. It is not mixed with any kind of grain, it is simply ground clover hay, nothing less. All of our hay was cut at the proper time, cured after our instructions, so as to retain the natural green color, no black or brown hay being used under any circumstances. This hay is all carefully stored in capacious barns, built especially for storing hay. We guarantee the quality of Pioneer Clover Meal to be unequaled by any cut clover on the market, in color, value and food elements. There is absolutely no waste, no danger of “crop bound” hens, and the smallest chicks can eat it equally as well as larger fowls.

For broilers and roasters no other food can equal it as a flesh former, promoting rapid growth and insuring a vigorous constitution. It is the flesh producer par excellence, and is the most natural food that young chicks can be fed. It should



PHOTOGRAPHIC VIEW OF A BENNETT & MILLETT CLOVER FIELD.

ficiently to make it safe to feed. We do not believe in feeding hot mash, only warm.

“In feeding the Pioneer Clover Meal to our hens, at present we are giving one large scoop full of meal to four of ground grain. We may add more clover later in the season, as we have in mind a number of experiments with the same.”

The Western Poultry Journal, Cedar Rapids, Iowa:

“After a careful test we are convinced that the feeding of clover as prepared by the Bennett & Millett Co., Gouverneur, N. Y., will produce wonderful results in egg production. Owing to the fact that clover contains lime in abundance and a larger proportion of protein than any grain, makes it certainly economical. While in the shape of meal, all the sticky and stem part is fed which, with ordinary cut clover, is a dead waste. Fanciers will find that it increases the supply of eggs, and at the same time keeps the fowls in a healthy condition, consequently there are more fertile eggs. A one hundred pound bag costs but \$2 and will feed an ordinary flock a month.”

“‘Clover—How is it best to save clover for fowls in the winter?
M. S. S.’

“You can purchase prepared clover, such as clover meal, cheaper than you can prepare it yourself; besides this clover meal is highly concentrated, is devoid of stems, dirt and trash and is a valuable preparation in the making of eggs. Of course, if you live on a farm and have clover you may use that cured in the regular way, by steaming. Yet the clover meal will give you better results all the time.” From *Fanciers' Review*.

be fed mixed with ground grains to obtain a balanced ration.

Here is a testimonial from a prominent breeder of Plymouth Rocks, etc.:

HARTLAND FOUR-CORNERS, VT., April 25, '98.

The Bennett & Millett Co.

Not long since I received a \$5 Champion Brooder, and in it found a sample package of Pioneer Clover Meal. I have given it a thorough trial according to directions and believe it to be the best thing on the market for small and growing chicks.

Very respectfully, GEO. D. WOODS.

We have hundreds of such letters on file in our office.

Our factory, situated at Wegatchie, N. Y., is a large stone building operated by four powerful water wheels. All the wheels are utilized in the manufacture of Pioneer Clover Meal. One machine alone requires fifty horse power to operate it. The capacity of the factory has lately been increased, by adding new machinery and alterations, to over two hundred sacks of Pioneer Clover Meal per day. It is the only plant of the kind on earth and it grinds out certain prosperity for poultry raisers in all parts of the world.

Prices of Pioneer Clover Meal—Five pound sample bag, 25 cents; fifty pounds, \$1; one hundred pounds, \$2, in bags. Send for book of editorial endorsements, “The Verdict of the Press” and sample of Clover Meal free if you mention this book.

THE BENNETT & MILLETT COMPANY,

GOUVERNEUR, NEW YORK.

DEATH TO LICE.

THE louse problem is one that poultry keepers are apt to solve by degrees, and not unlike a secret organization, each degree proves a costly even though a paying experience. Hens are often affected, yes, are real lousy before their owners are aware of it. No one professes to know how these pests originate. It does seem oft times they need no progenitors, they just grow, and before we

know it are sapping away strength and vitality from the best of our flock. Time will show their presence. Infertile eggs, sickness, and increased mortality will result.

Body lice on fowls are as numerous in winter as during warm weather. They center among their fluffy feathers, principally beneath the vent. They deposit nits at the base of feathers, which will produce more troublesome ticklers so that if not vanquished they will soon be swarming. This is where *Lambert's Death to Lice Powder* is invaluable. A dose gives immediate relief, and a frequent dusting will keep a fowl clean, comfortable and profitable. If a little could be placed in or around their tail feathers while at roost, say once each month, there would be no need of handling each bird separately. A handful in each nest will keep the layers all right, and nothing but lice and bad smells are killed with this powder.

Little chickens are often victims of head lice. They fasten their fangs into the cranium of the little "peepers," when from two to six weeks old, and suck the very life from every chick, unless removed by force or an application. *Death to Lice Ointment* is an old English remedy for head lice on children, and it works equally effectually on chickens. A hundred can be treated in, say, ten minutes, without affecting the growth of a chick in any way.

Mites or spider lice often take possession of a hen-house or brooder. They hide in cracks and crevices by day, and crawl out on their victims at night, feasting on their blood until the lice are red as lobsters in the morning. *Death to Lice Special* is a powder designed to be dissolved in kerosene or coal oil and used as a paint for henneries; or it can be diluted with water for a brooder wash, etc., resulting in clean quarters and healthy inmates. These remedies are manufactured by a practical poultry keeper whose chickens grow and whose poultry farm is a profit-

able one. No one has finer birds or gets better results from them. Keeping the birds clean and comfortable is the only secret of success. Ten cents in stamps will secure a liberal sample of either of the above remedies; twenty-five cents will bring all three to your postoffice or door, together with further particulars.

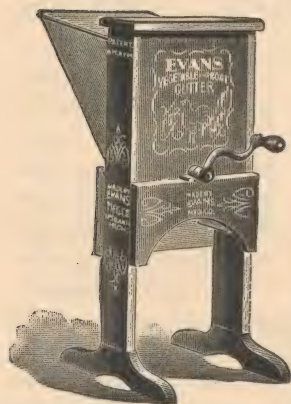


ADDRESS,

D. J. LAMBERT,

BOX I, APPONAUG, R. I.

You Might as Soon Expect a Mill to Turn Out Flour With No Wheat in the Hopper, as to Look for Eggs From a Hen Without Proper Food.



FRESH EGGS IN WINTER

Are easily attainable if the hens are fed properly. They consume great quantities of clover, grass and other green food in summer, but in winter they can not get them.

EVANS VEGETABLE AND ROOT CUTTER

Will supply this deficiency. It will cut beets, carrots, turnips, potatoes, cabbage, etc., into fine pieces so that all of the fowls, big and little, will eat them. It will solve the winter egg problem very shortly and make the hens lay during cold weather. The feeding of these roots, which cost comparatively nothing on the farm except the labor necessary to their preparation, will

SAVE ONE-HALF THE GRAIN FEED.

These cutters are made in four sizes, and sell for one dollar up. They turn easily, cut fast, and will last indefinitely. Circular free if you will kindly mention this book.

EVANS MANUFACTURING CO.,
YPSILANTI, MICH.



NEW CAPONIZING TOOLS.

These instruments are manufactured from the best brass and tool steel, and are substantially, neatly and honestly made. They are nickel plated, and are contained in neat cases of polished wood or cloth covered wood, and plush-lined like the ordinary surgical case. The set, which includes caponizing spoon, spreader, knife, probe, bodkin, and hooks and cords for fastening the bird is inclosed in the case. It is forwarded, postpaid, to any part of the United States for \$3.00. We will also for the convenience of

patrons, sell the various instruments separately at the following prices: Caponizing spoon, \$2; cords and hooks, per set, 20 cents; knife, 50 cents; spreader, 50 cents; bodkin, 20 cents; probe, 20 cents. We send our illustrated catalogue, price list and book of instructions free on receipt of 2-cent stamp.

Remittances by money order, express or postoffice order, bank draft or registered letter must accompany all orders.

Our instruments will be found for sale with many of the leading poultry supply houses throughout the United States and Canada. They can only be obtained through us or our agents, as the instruments are protected by patent both in the United States and Canada.

We invite the consideration of the poultry fraternity, and ask them to explore the new field of revenue which caponizing offers, and to participate in the profits it assures to the many honest and industrious men and women engaged in the poultry industry throughout the land.

Address,

Allerton Caponizer Mfg. Co.,
ALLERTON, IOWA, U. S. A.

THE PROPER FEEDING OF CHICKS.

The Danger of Improperly Balanced Rations—How to Attain the Former and to Avoid the Latter.

Important Information For Fanciers and Growers For the Market.

The successful hatching of chickens by artificial means, after many years of patient research and experiment, has been practically accomplished. It is in the proper raising of the chickens after they are hatched that the poultryman of to-day meets with most of his mishaps; diarrhea, constipation, leg-weakness, imperfect development of the body and unnatural feathering, all unerringly point to the fact *that the ration fed is improperly balanced*. To overcome this difficulty and provide a food that shall properly develop the bones, muscles, tissues and feathers has been our constant aim, and poultrymen will find in AMERICAN POULTRY FOOD an article that will meet these requirements.

Broiler men and those engaged in raising winter chickens for roasting purposes will find this to be the best preparation on which to grow their stock, and the large number of prize birds found in the showroom that have been raised on AMERICAN POULTRY FOOD amply testify to its worth to the fancier.



A MORNING MASH.

AMERICAN POULTRY FOOD is not a condition powder nor a medicine, but a *morning mash*, a balanced ration made wholly from the best wheat, barley, oats and corn, all of which have been kiln dried, ground and thoroughly mixed together. It is sold only in sealed and branded sacks, which protects purchasers from the substitution of common feed.

The time saved in using a balanced ration, ready mixed, the knowledge that the AMERICAN POULTRY FOOD is prepared under a formula and will always be found to be just the same, its moderate price and substantial endorsement by poultrymen, should recommend it to all who raise poultry.

Remember it is to be had only in sealed sacks, plainly branded.

For full information regarding AMERICAN POULTRY FOOD and how to feed it send for our pamphlet, which tells all about it.

The manufacturers of AMERICAN POULTRY FOOD freely offer the services of their feed expert to assist in the solution of all questions pertaining to the proper feeding and care of poultry, and invite everyone seeking information on such matters to write them, carefully stating their difficulties.

Practical Poultry Feeding, an invaluable book, which covers a wide range of subjects of vital interest to poultrymen, will be sent postpaid on request. Address,

THE AMERICAN CEREAL CO.,

SCIENCE DEPARTMENT,

1335 Monadnock Building.

CHICAGO, ILL.

POULTRY SUPPLIES

AT WHOLESAL PRICES.



P. H. SPRAGUE, PRESIDENT SPRAGUE COMMISSION CO.

"The Poultryman, and Shippers' Friend."

We also make a specialty of the following standard poultry supplies:

CRUSHED OYSTER SHELLS.

All breeders of poultry recognize the fact that a grit of some kind is a necessity. Even where the fowls range, strength and plumpness are gained by providing them with Crushed Oyster Shells. The most frequent cause of *hens not laying* is the absence in the food of *carbonate of lime*. As Crushed Oyster Shell is practically pure carbonate of lime, it supplies, when fed to poultry, this most essential element, and greatly aids in the formation of the egg.

Limestone, gravel, grits, in fact nothing of a mineral character, will equal Crushed Oyster Shells in beneficial results.

MICA-CRYSTAL GRIT.

This is a Rock Combination of Silica, Aluminum, Iron and Magnesium. Everyone knows that hens have no teeth, and that the food is masticated in the gizzard. But the gizzard itself is a feeble agent, and can not perform its functions without the aid of some substance that is hard and sharp. Nature, therefore, prompts the hens to pick up and swallow gravel, glass, small shells and other substances, but it may be noticed that they prefer such as are sharp and irregular. Round bits of gravel do not serve the purpose, though better than nothing, and the gizzard is not injured, no matter if the sharpest and keenest glass be swallowed. The food and hard substances are kept in constant motion while in the gizzard, and the entire contents are ground into an impalpable powder.

FRESH GROUND RAW BONE.

A wrong impression exists regarding bone. Fresh bone contains 53 per cent moisture and 12 per cent grease so that when you buy fresh bone you pay for 65 pounds of useless material for every 100 pounds you buy. Our bone is made from fresh, green bone, and the moisture and grease are taken out, leaving nothing but the phosphate of lime and nitrogen. These are the only two feeding properties of the bone, so that when you buy our bone you get all of the feeding properties, without buying or paying freight on moisture and grease, and you get an article that will keep in any kind of weather if kept dry.

To get best results in poultry raising the use of something of the kind is positively necessary. Every poultry house or yard should have a pan or trough full, so that the fowls can have access to it at all times.

We quote above goods in 100-lb sacks, F. O. B. Chicago. Terms cash.

	Crushed Oyster Shell.	Mica-Crystal Grit.	Ground Bone.
One hundred-pound bag.....	\$ 0.75	\$ 0.75	\$ 2.00
Half ton.....	6.00	6.50	18.00
One ton.....	10.00	11.00	35.00
Two tons.....	18.00	20.00	68.00

SPRAGUE COMMISSION CO.,

218 South Water Street,

CHICAGO, ILL.

POULTRY FOR MARKET.



When you have any for sale write for prices to

PHILIP QUIGLEY,
Produce Commission Merchant,
303 South Front Street,
PHILADELPHIA, PENNSYLVANIA.

* * * *

Broilers (chicks) bring best prices from April 20th to June 1st.

Fowls, roasting chickens and small turkeys, in January and February.

Capons, slips and old ducks, in February and March.

Young ducks, in June, July and August.

Large turkeys (any weight over fourteen pounds) should be in market for Christmas trade, as that is the only time they will sell to advantage. All kinds of grown poultry, with the exception of heavy turkeys, will bring better prices after January 1st than any time before.

Information and particulars given on application.



M. M. S. POULTRY FENCE



Patented July 21, 1896.

[TRADE MARK.]

Patented July 6, 1897.

Made of best galvanized steel wire; strongest, most effective, always keeps in perfect shape without top or bottom rail. Requires but few posts. The completed fence is not only the best, but the cheapest. Inquire of local dealer or write direct to

DeKALB FENCE CO., DeKalb, Illinois.

LIQUID INSECTICIDES.

A SHORT HISTORY OF LEE'S LICE KILLER

BY GEO. H. LEE.

It has been suggested that an exposition of the merits of leading insecticides would not be amiss in a book devoted to "Incubating and Brooding." In such an essay, Lee's Lice Killer could not well be omitted, as it is an article of world-wide reputation, yet of comparative recent origin.

Lee's Lice Killer, or rather the formula to which the name Lee's Lice Killer was subsequently applied, was discovered during the spring of 1895, by the writer, who was at that time engaged in the breeding of "fancy" poultry at the town of Exeter, Fillmore County, Nebraska. Being also engaged in mercantile business, and having but a limited amount of time to devote to our feathered pets, the matter of insects and insect destroyers became a question of momentous importance.

When the matter of time, labor and expense are not taken into consideration, the lice and mite problem is comparatively unimportant. Insects are easily destroyed where there are only a few to deal with. For instance, if you have half a dozen or less fowls and will give them daily attention, handling them and dusting with insect powder, etc., you will probably never be seriously troubled with poultry vermin. When, however, the number of fowls and chicks increase to twenty-five, fifty or one hundred, the handling of individual specimens becomes a serious item of labor. It is useless to attempt the destruction of the vermin on a portion of the flock, as in one night the migration of the insects from one fowl to another will undo all of the work which has been done, and none but a careful poultry breeder can appreciate the wonderfully rapid increase in numbers of lice and mites when once they obtain a footing in the poultry house.

Especially in winter is this the case. Few breeders realize the fact that in the winter season lice are worse than in the summer, if the fowls have liberty during the latter period. In the cold weather the fowls are heavily feathered, are generally closely confined and do not have access to nature's insecticides in the form of moist earth, etc. The dust bath is of course a feature in many poultry houses, but dust in the poultry house cannot be too severely condemned as a producer of diseases of the lungs and bronchial tubes. Dust of any kind is an effective insecticide if applied only to the insects, but when breathed by fowls or animals it produces serious results that more than balance the benefit derived.

All of these matters received our serious consideration in a course of experiments extending over a period of two years. We were searching for an insecticide which would save us the labor of handling the individual fowls and which would be inexpensive and easily applied. At that period we had no thought of the marketable value of such a preparation, but were looking simply to our own convenience and profit. The result of our labors is known throughout the United States and foreign countries under the name of Lee's Lice Killer. We finally succeeded in preparing a fluid possessing properties in excess of our most sanguine expectations. Near-by breeders were delighted with the working of it and urged the placing of it on the market. This we did in a small way, in the fall of 1895, and returns were so satisfactory that our present business, extending over the entire United States, Canada, Mexico, and several European countries, is evidence of what can be done with a reliable article brought to the attention of the people by judicious advertising.

Lee's Lice Killer possesses the peculiar property of not requiring contact with the vermin in order to kill them. All that is necessary is for the fowls to roost over, and close to, a surface painted with the liquid. The odor arising from the painted surface is what performs the work of extermination, and as it penetrates through and through the feathers of the fowls, it does more thorough work than the most careful dusting can do.

Painting the roost poles, roost supports and nest boxes exterminates all mites and bugs that may find a harbor in and about the cracks and crevices of the poultry house, also a great many of the body lice on the fowls. The reason why painting the roost poles alone does not kill all of the body lice is that the fowl is sitting on a very narrow surface and the front and rear portions of the body receive but a very small portion of the odor from the painted surface. To exterminate the body lice thoroughly, it is therefore necessary to have a wider surface for the fowls to roost over. This is easily done by placing a wide board close up under the roost and painting

both the board and the roost with the Lice Killer. We have designed a form of roost suitable for the purpose and possessing desirable features in being easily removable and easily cleaned. The roosts and boards run the full width of each pen and rest on cleats attached to the partitions or sides of the poultry house. The roosts rest on a separate cleat above the board, and the latter may be removed at any time without disturbing the roosts. By having the poultry house arranged in this manner and painting with the Lice Killer at intervals of two weeks or a month, the fowls and poultry house can be kept entirely free from vermin at a very small expense and almost no labor, as the painting occupies but a few minutes each time.

In cases where it is not convenient to prepare the roosts as above outlined, the fowls may be placed (a few at a time) in a box, the bottom of which has been painted inside with Lee's Lice Killer. The top of the box should not be too tightly covered, or there would be danger of smothering the fowls if left for too long a time. When Lee's Lice Killer is used in the nest boxes, a little sand or moist earth should be placed in the bottom of the box, then a layer of straw or other nesting material. This prevents the Lice Killer from affecting the flavor or germ of the egg.

It is not necessary or desirable that Lee's Lice Killer be used with very young chicks. Where chicks a week old are infested with lice, it evidences a deplorable state of affairs on the premises generally. If the old fowls and the poultry houses are kept free from vermin, there will be no difficulty as regards lice on the young chicks. Where the chicks are running with a mother hen, the hen should be given attention for lice at the start. If, however, this has not been done, and the whole brood is infested, the hen should be removed from the chicks and placed for a couple of hours in a box painted with Lee's Lice Killer. This should be repeated at intervals of several days, and the odor remaining in the feathers of the mother hen will kill the lice that are on the chicks.

In no case should young chicks be placed in a box or coop with Lee's Lice Killer, either alone or with the hen. If the coop is slatted or open, the sides may be painted with the lice killer, but not the bottom, as the hen would smother the chicks by pressing them down on the painted surface.

Lee's Lice Killer is of the nature of an anæsthetic, such as chloroform, rather than an irritant poison, such as bisulphide of carbon. All of the imitations of Lee's Lice Killer that we have examined depend for their virtue as insect destroyers on the bisulphide of carbon, and it is for this very reason that they are so unreliable, and either do not do the work at all or kill the fowls in the operation. Bisulphide of carbon is an irritant poison and should never be used about a house or other enclosure. It is dangerous, both to the person using it and to all other living creatures.

Lee's Lice Killer is absolutely harmless to grown fowls and animals except when they are so closely confined with it as to breathe it unmixed with atmospheric air. It is, however, peculiarly destructive to insects that breath through the pores of the body.

Lee's Lice Killer should never be applied to the body of an animal or fowl (except hogs), as it has a blistering effect when applied to skin which is covered with hair or feathers. For hogs, it is used by painting the floor of their sleeping pens, also the rubbing posts, which should first be wrapped with an old gunny sack or cloth. For horses, cattle, dogs, etc., paint an old sack or blanket with the lice killer and tie it over the animal.

In all cases where fault is found with Lee's Lice Killer, we solicit correspondence direct with the person finding cause for complaint, as we use every effort to see that our preparations give perfect satisfaction. We have traced several cases where unscrupulous dealers and agents have purchased our lice killer in bulk and diluted it with kerosene oil and other cheap material, for the sake of the larger profit to be obtained. We also have a case now pending in court against an agent who has been selling an inferior preparation as Lee's Lice Killer. Such cases are few and far between, but we can only trace them through the consumer and we therefore request that we be informed when any cause for complaint is noticed by the user of our Lee's Lice Killer.

In conclusion, we desire to say to those who may have tried imitations of our Lice Killer, but not the genuine, and

found them wanting. "If the original is worthless, there will be no imitations." The fact that our Lice Killer has been imitated in nearly every state in the Union, simply emphasizes its value. We append to this article two letters recently received from a prominent eastern breeder, which are self-explanatory and which are but samples of daily correspondence received by us:

WEST ALEXANDER, PA., July 25, 1898.

Geo. H. Lee Co., Omaha, Neb.

Enclosed find 75 cents, for which please ship us from nearest supply house one gallon Lee's Lice Killer. Mr. Grant M. Curtis, editor of the *Reliable Poultry Journal*, visited us two weeks ago and staid over night with us. We were telling him that we had tried several liquids for lice killing, that they had failed, and that we had no faith in any of them. He advised us to *try yours before condemning all*. We do this on his recommendation. If results are satisfactory we want more and would like the agency here if we can honestly recommend it.

W. B. GIBSON & SONS, Breeders of Barred P. Rocks.

WEST ALEXANDER, PA., August 11, 1898.

Geo. H. Lee Co. Omaha, Neb.

GENTLEMEN:—We have given the L. L. K. a thorough trial and can cheerfully recommend it. It will do all that is claimed for it; we *know it*. We find no trouble in keeping clear of the small lice that harbor on or about the roosts during the day and attack the fowls at night, but have found the large body lice very hard to banish entirely. Lee's Lice Killer, painted on the roosts only, will kill a great many, but to paint the bottom of a large tub or close box with it and place the fowls in it for three hours, will positively kill every louse of any or all species on them. *We would not be without it if the cost was \$10 per gallon*. We are quick to praise a good thing and equally willing to condemn a worthless article.

W. B. GIBSON & SONS.

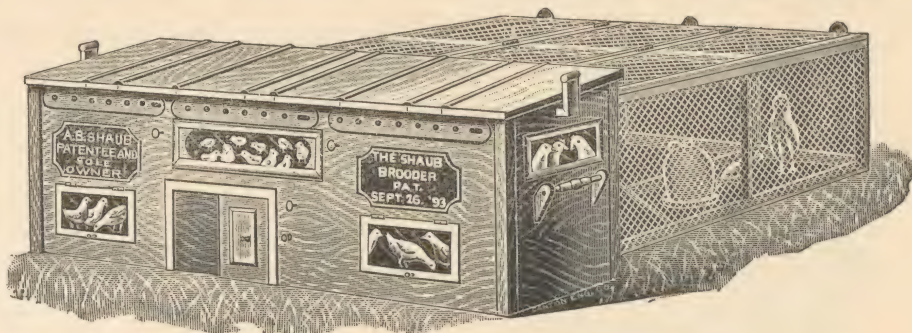
NOTE.—The headquarters of the GEO. H. LEE CO. are now located at 1110 Farnam street, Omaha, Neb., where they manufacture a full line of insect and vermin destroyers. They publish a 64-page book entitled, "How to Get Rid of Insects and other Vermin," also "Remedies for Poultry and Stock." This book, with advertising matter, is sent free on application.

The Ideal Winter Brooder.

THE SHAUB BROODER.

THE BEST IN
THE WORLD.

Patented in 1893. Over 5000 now in use in every state and territory in the Union, and over 300 in Canada. Up to date there has not been a single complaint.



Complete plans how to make it yourself. Send stamp for circular. Address

A. B. SHAUB, Canton, Ohio.

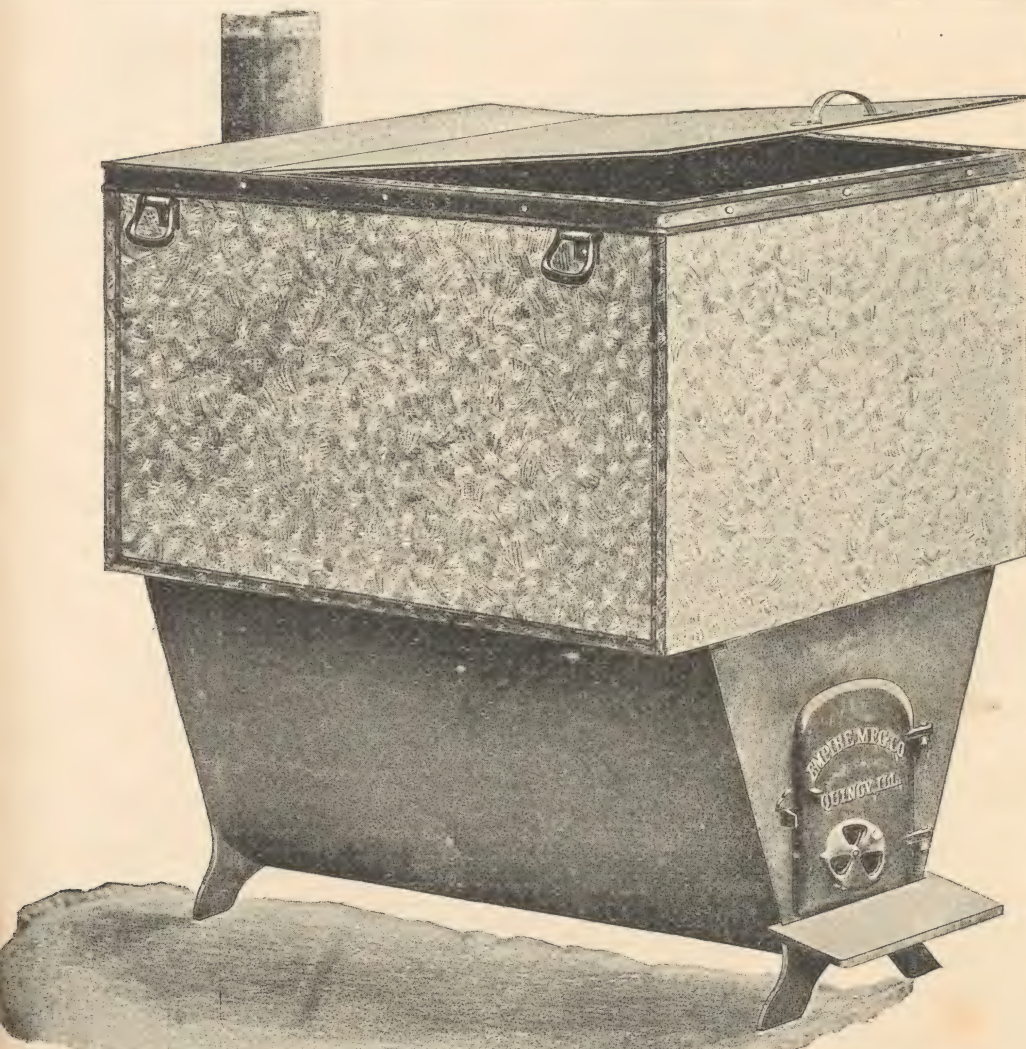
Farmer's Handy Feed Cooker.

We desire to call our readers' attention to the Farmer's Handy Feed Cooker, which is sold at the low price of \$12.50 for 50-gallon capacity.

By feeding poultry and stock with cooked food during the winter months, at least one-third of the food is saved; also having stock in a healthy condition, preventing hog cholera among your hogs and insuring the hens laying freely during the winter months when eggs are always wanted at high prices. This Cooker will pay for itself in one week's time and is without doubt the best and cheapest on the market—just what its name implies, a Farmer's Handy Feed Cooker. They are made in all sizes. A catalogue giving a full description sent on application.

**EMPIRE
MANUFACTURING
COMPANY,**

QUINCY, ILLINOIS.



Everything for the Poultry Yard.

A LITTLE GOOD ADVICE—This book tells you in a practical, concise way, *how to succeed* in the different branches of poultry culture. Its writers are men of experience, not mere theorists; hence those who follow their teachings need not fear of failure, provided they make the proper effort and have the *facilities and proper appliances* for carrying on the business.



BARRED PLYMOUHL ROCKS.
"Greatest General-Purpose Fowl."

try and poultry supply business—we have made it a study. We are the acknowledged headquarters for "*Everything for the Poultry Yard*". Ours is the oldest established poultry farm and supply house in the west. Our stock is the *most complete*, our prices *the lowest*. We are prepared to furnish you everything needed to equip a complete poultry plant, be it a flock of a dozen for recreation, or a full fledged poultry farm.

We are Patentees and Sole Manufacturers of the "New American" Incubator and Brooder, triumphs of incubator and brooder manufacture. We furnish eggs for incubators by the hundred or

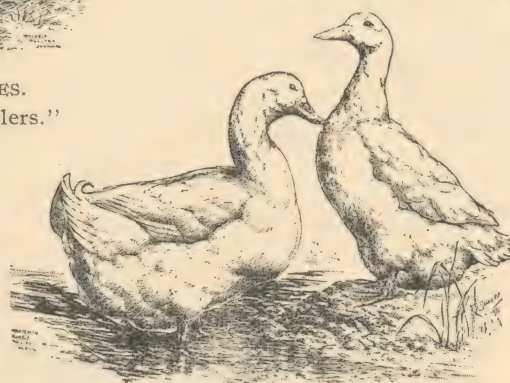
thousand. If you want pure bred stock, we can supply you of the following breeds, which we have made a specialty and study for years: Barred and White Plymouth Rocks, Light Brahmas, Langshans, White Wyandottes and Pekin Ducks.

Lack of space prevents our giving you further details, but our *catalogue will tell you all*. It is a pretty book of eighty, 6x9 pages (fifteenth edition). It fully illustrates and describes our Incubator and Brooder; describes and prices to you the cheapest and most complete stock of poultry supplies it the United States; it tells all about our pure bred poultry; it shows numerous half-tone engravings of the "Michigan Poultry Farm," showing arrangement of grounds and buildings. It is a book that will please and interest you. More than one hundred thousand have been sent out. We will send you one *for the asking*, if you will mention this book.

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